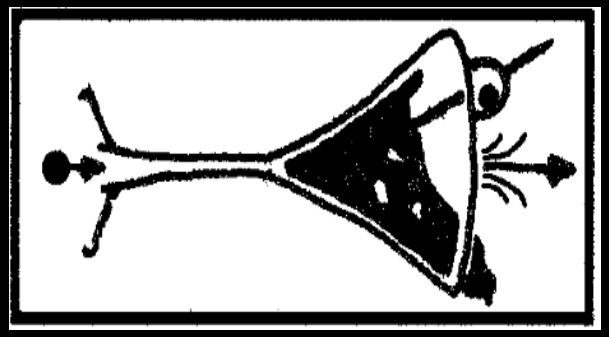
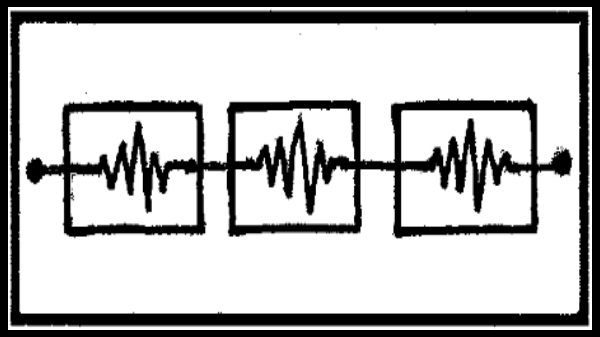
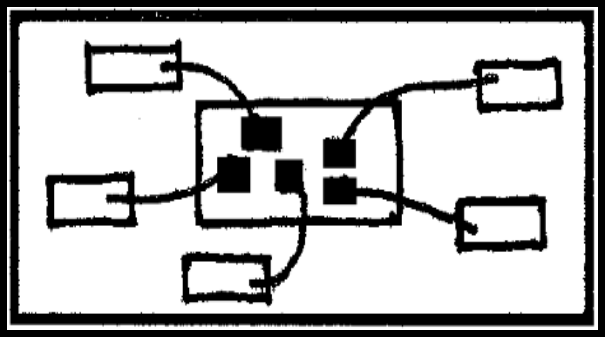
CSE 442 - Data Visualization

Narrative Visualization







Jeffrey Heer University of Washington

(with material from Edward Segel & Jessica Hullman)

STORYTELLING

as ancient as mankind

STORYTELLING

across various media

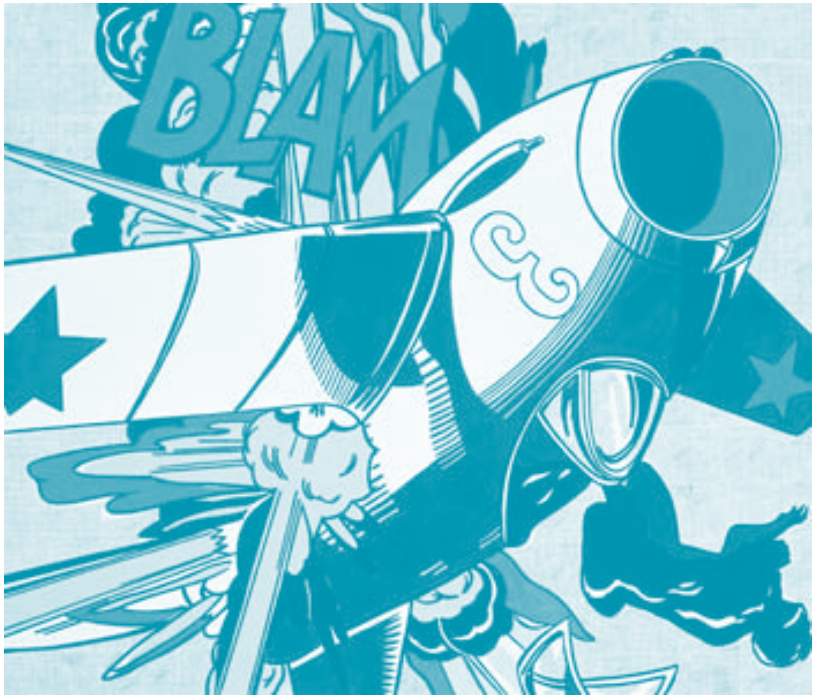
PEOPLE TELL STORIES

WORDS TELL STORIES

IMAGES TELL STORIES

COMICS TELL STORIES

MOVIES TELL STORIES



Narrative Story-Telling

narrative (n): An account of a series of events, facts, etc., given in order and with the establishing of connections between them.

Effective story-telling “require[s] skills like those familiar to movie directors, beyond a technical expert’s knowledge of computer engineering and science.” - Gershon & Page ‘01

August 26, 2010

Generals Wary of Move to Cut Their Ranks

By GINGER THOMPSON and THOM SHANKER

WASHINGTON — Maj. Gen. Paul D. Eaton, a retired Army officer, is familiar with the perks and pitfalls of power, having commanded tens of thousands of troops at Fort Benning, Ga., managed budgets exceeding $2 billion in Iraq, and overseen layers upon layers of staff members who helped manage both his professional duties and his personal life.

He has experienced the full range of lifestyles that come with military leadership, living at one point in an elegant antebellum mansion, and at another, with eight other officers crowded in a marble bathhouse behind one of Saddam Hussein's old palaces.

When he traveled, he was occasionally able to justify the use of military aircraft, but most times, he said, he flew coach. And today he lives on a pension worth 75 percent of his military salary, with health benefits that cover everything except dental and eye care for himself and his wife.

"We are well compensated, and we live very comfortable lives," General Eaton said, referring to the military's most senior leaders. "But when you look at all the things going on around a general, the nation is getting a very, very high return on its money."

Not everyone at the Pentagon agrees. Two weeks ago, Defense Secretary Robert M. Gates announced a sweeping effort to improve efficiency that, among other things, takes aim at the military's sacrosanct corps of generals and admirals, ordering his staff to cut at least 50 positions, and making clear that he would be happier if they cut more.

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Anecdotal Lead

August 26, 2010

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Nut Graph

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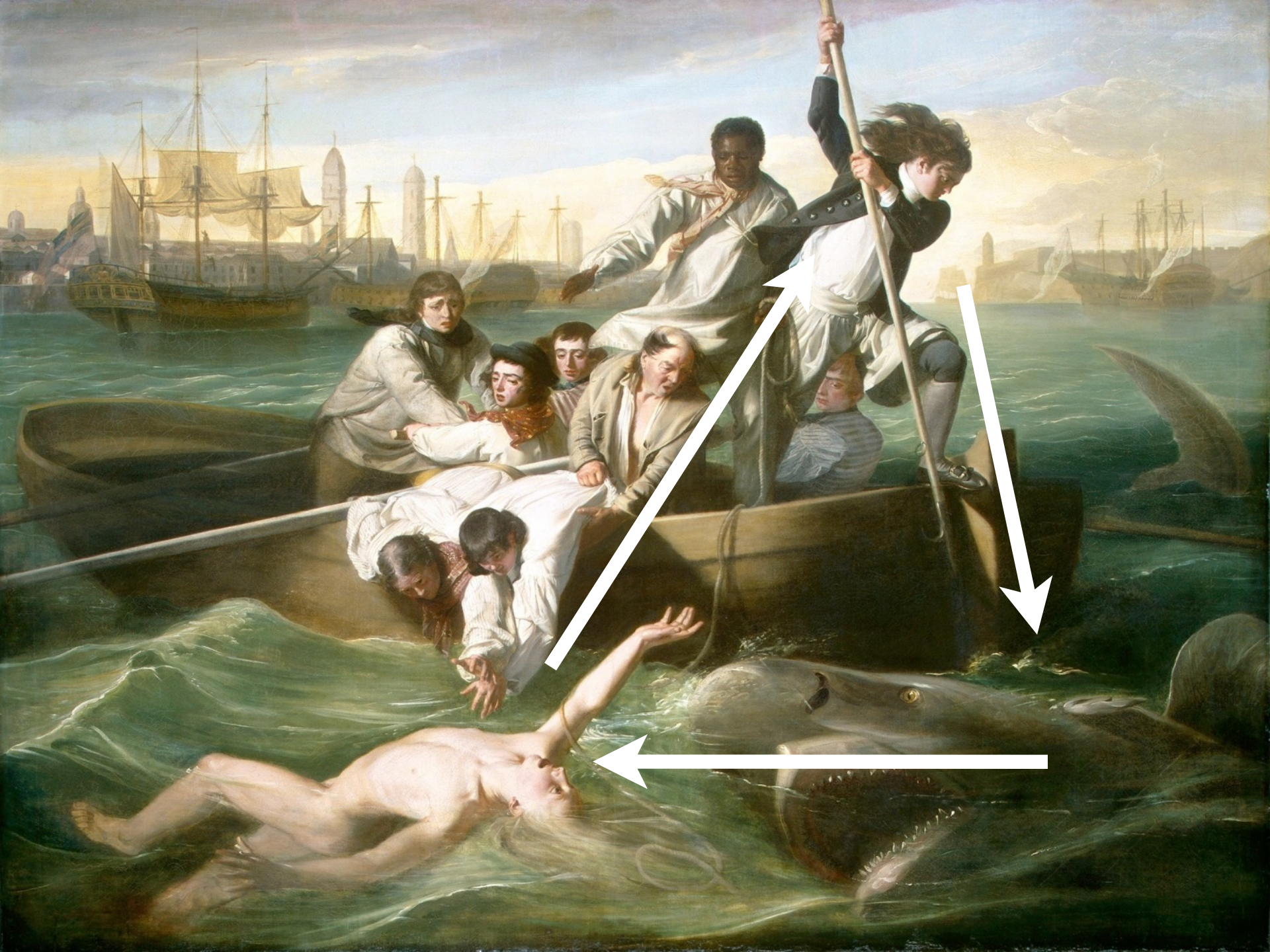


BLAM

Topics

Narrative visualization design

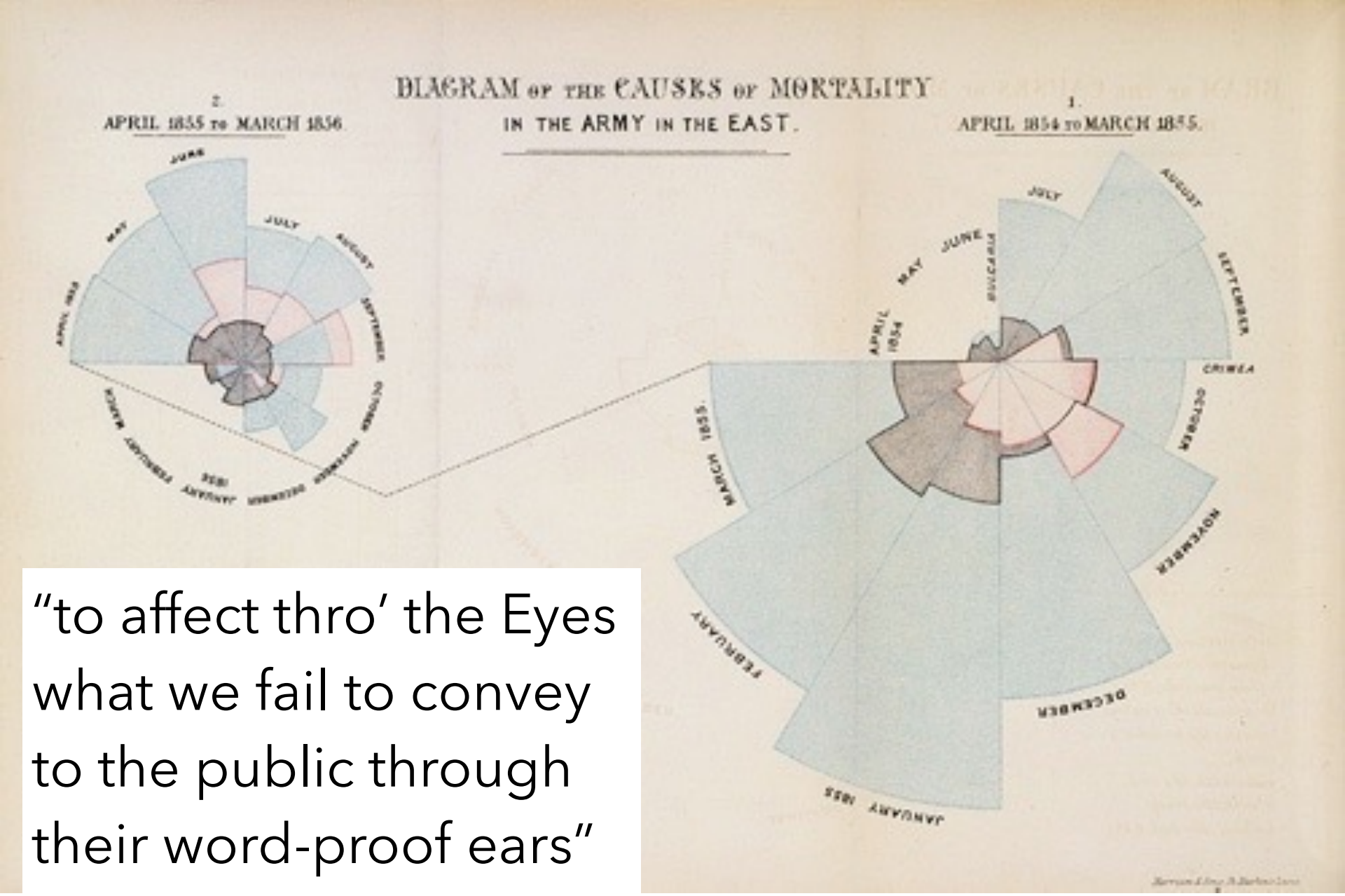
Navigation in interactive documents

Chart sequence models

Automatic augmentation for communication

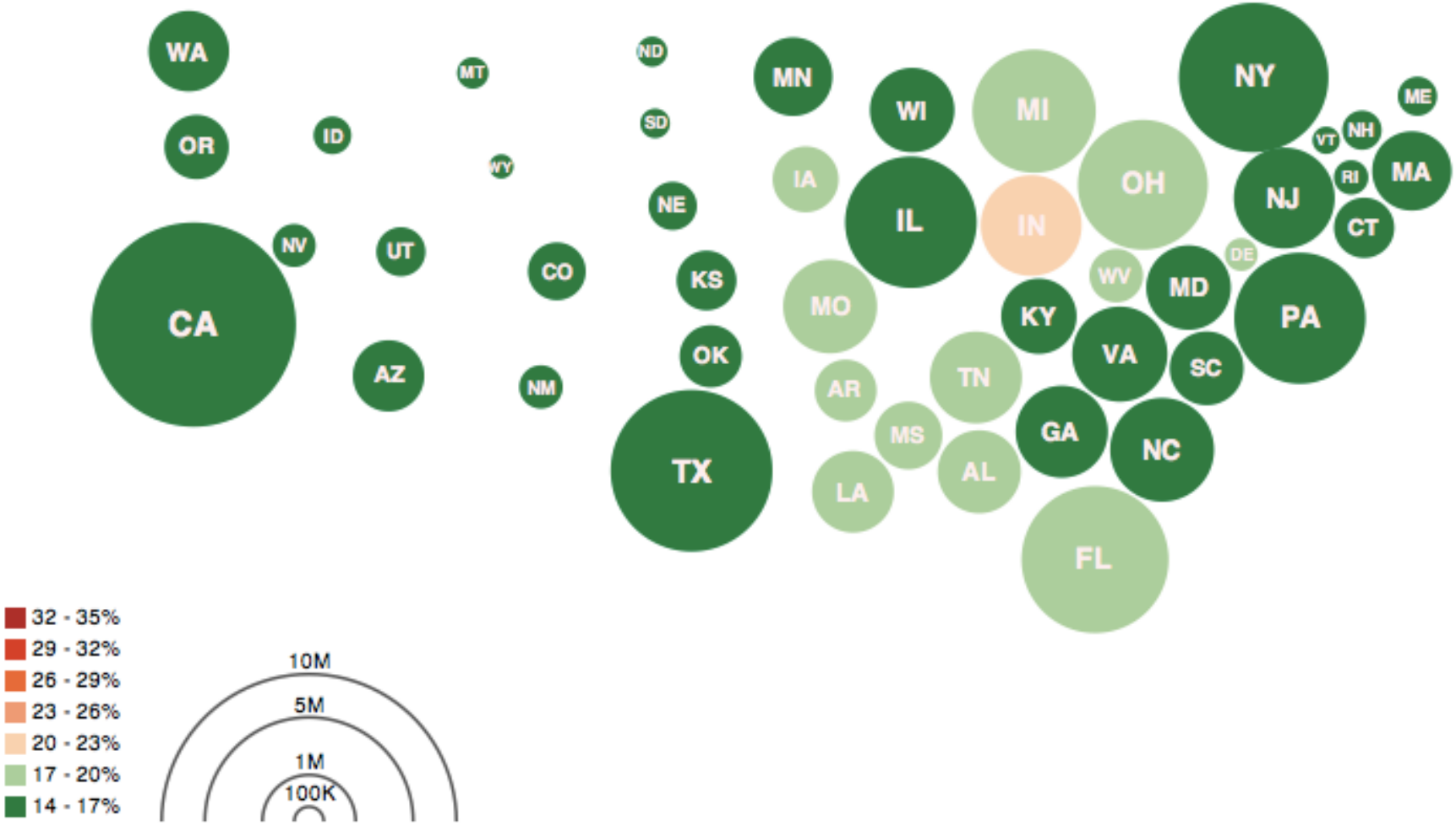
Collaborative visualization

Storytelling
… with data?

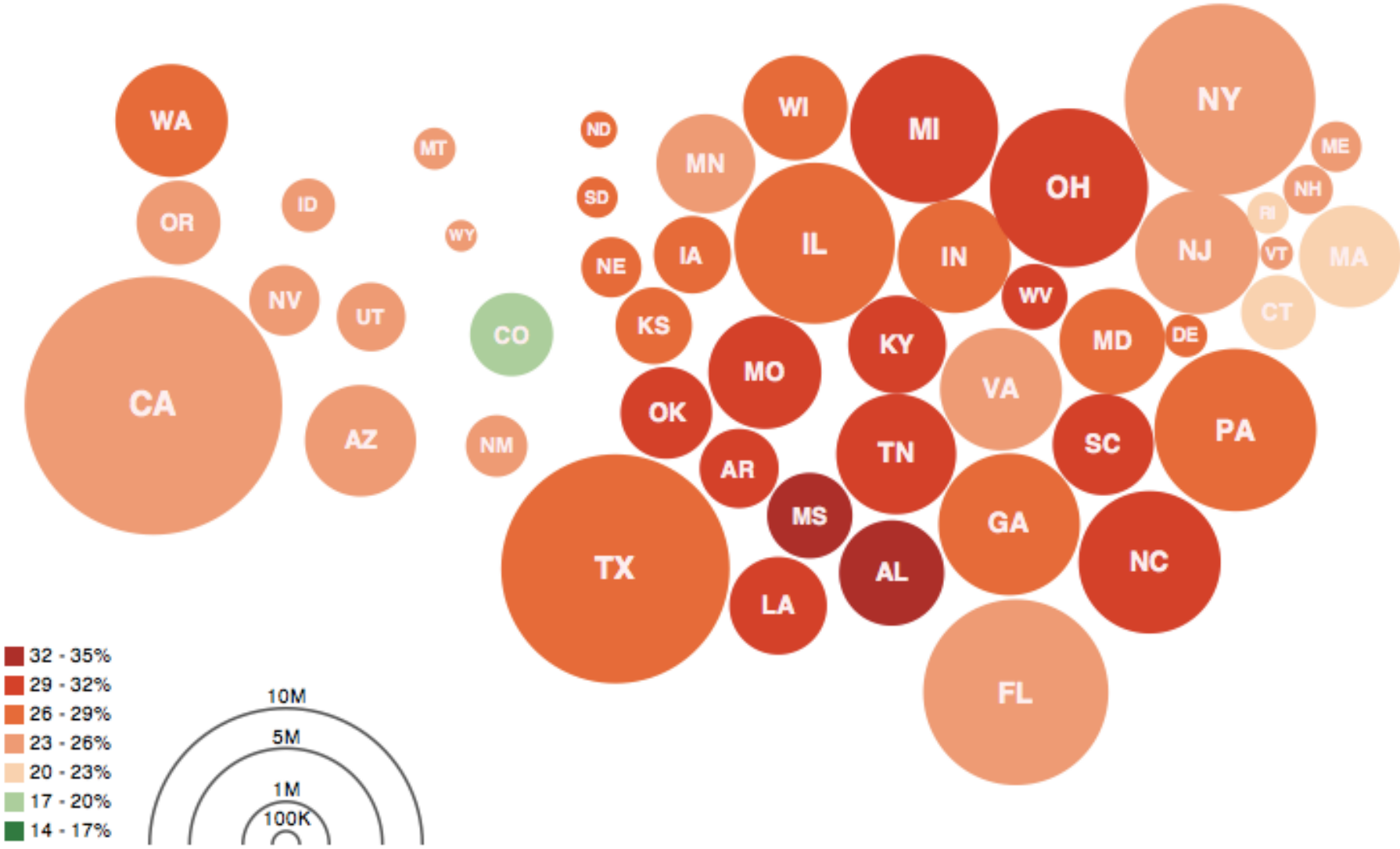


"to affect thro' the Eyes what we fail to convey to the public through their word-proof ears"

1856 "Coxcomb" of Crimean War Deaths, Florence Nightingale



Obesity Map Vadim Ogievetsky



Obesity Map Vadim Ogievetsky

Also in this section
68 Suing companies
68 The recovery of General Motors
68 Business crime in China
70 Indian retail
70 Japan's drug firms on the move
71 Brazilian tobacco
71 Schumpeter: Overstretched

Privacy and the internet

Lives of others

Facebook and Google face a backlash from users and regulators alike, over the way they have handled sensitive data

JENNIFER STODDART, Canada's privacy commissioner, is not happy with Facebook. In August 2009 the social networking site struck a deal, agreeing to change its policies within a year to comply with the country's privacy law. It now says Ms Stoddart, the company appears to be changing an important part of the deal, which involved giving users a clear and easy-to-implement choice over whether to share private data with third parties. "It doesn't seem to me that Facebook is going in the right direction on this issue," she says. Having that, without a change of course, the firm could soon become the subject of another lawsuit or investigation by her organisation.

Facebook is not the only internet giant to provoke the ire of data watchdogs. Google endured withering criticism this week following news that it had recorded some personal communications sent over unencrypted Wi-Fi data networks in homes and offices in some 30 countries. On May 11th Peter Schaar, Germany's federal commissioner for data protection, called for an independent investigation into Google's behaviour, claiming that it had "deeply disrupted normal rules in the development and usage of software."

The cases highlight rising tension between guardians of privacy and internet firms. And they reflect concern among web users about how private data are made public. Several prominent internet types such as Cory Doctorow, a science fiction author, and Ian Lopatin, a publisher, have abandoned Facebook. Sites such as QuitFacebookDay.com are urging others to do so on next Sunday, May 31st (a more Facebook "suicide").

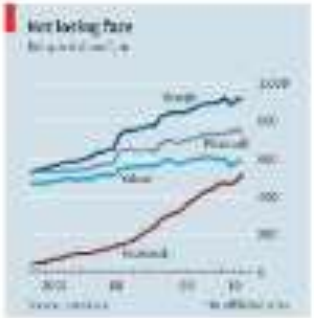
There is unlikely to be the mass exodus of Facebook, which is poised to claim its 1 billion member (see chart), for reasons that have been ranked at the company's headquarters in Silicon Valley, where bosses are mulling over how to respond. Several senior folk are now hinting that Facebook will soon roll out simpler privacy controls to make it easier to keep more data hidden. MySpace, a rival, is already making it central to its strategy to woo disaffected Facebookers to its service.

A revolt over Facebook's handling of privacy has been brewing for some time. In December the social network changed the default settings on its privacy controls so that individuals' personal information would be shared with "everyone" rather than selected friends. Facebook argued this reflected a shift in society towards greater openness and noted that users could still adjust privacy settings back again. But frustrated privacy activists lobbied for it to be reversed.

The switch should not have come as a surprise. Sadly for users, many social networks impose leaky to-ish privacy policies in order to attract and motivate users. But as more join, users are gradually lowered to encourage more sharing. As people share more, Facebook can increase the traffic against which it sells advertising. And the more it learns about users' likes and dislikes, the better it can target ads that generate hundreds of millions of dollars.

Privacy groups have been still following a [illegible] announcement last month at which Mark Zuckerberg, Facebook's boss, announced yet another series of policy changes. One that caused irritation was an "instant personalisation" feature that lets certain third-party websites access Facebook data when people visit. Critics say that Facebook has made it tricky to disable this feature, which may explain why so few Britons' clothes it to reach.

Europeans officials are getting busy with Facebook too. This month a group of data-protection experts who advise the European Commission wrote to the social network, calling its decision to increase the default settings "unacceptable". And in the [illegible]



small support afterthought boring?

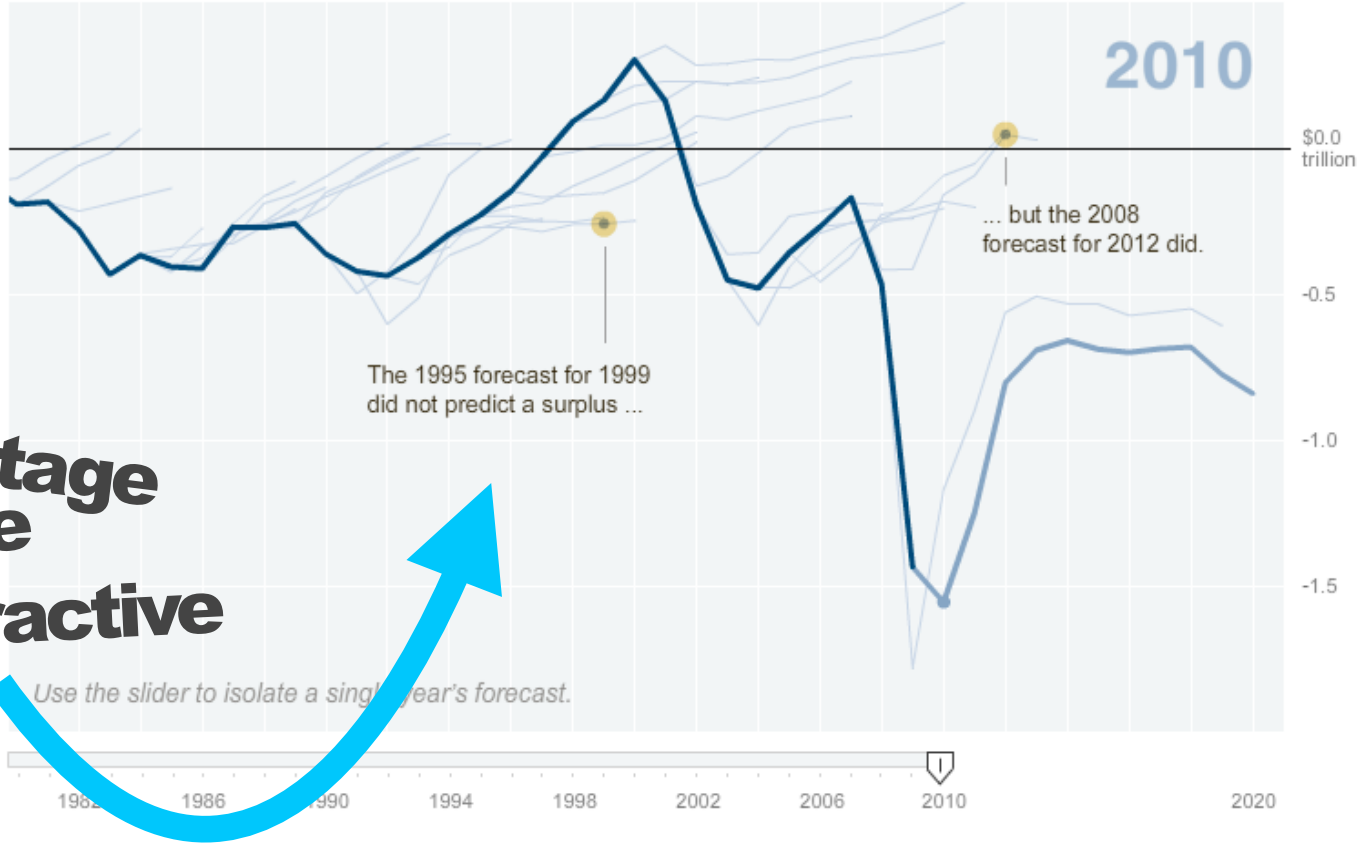
Published: February 2, 2010

Budget Forecasts, Compared With Reality

Just two years ago, surpluses were predicted by 2012. How accurate have past White House budget forecasts been?

Latest forecast

Today, with a better understanding of the severity of the economic downturn, the deficit situation is much more dire.



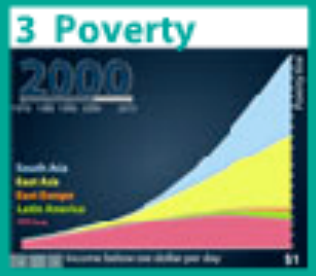
center stage
standalone
interactive
guided

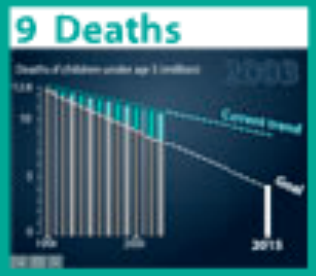
Human Development Trends 2005

Interactive presentation of some of the messages in the Human Development Report 2005

English
Dansk
Portuguese
Suomi
Français
Deutsch

Produced in collaboration with:
GAPMINDER
www.gapminder.org

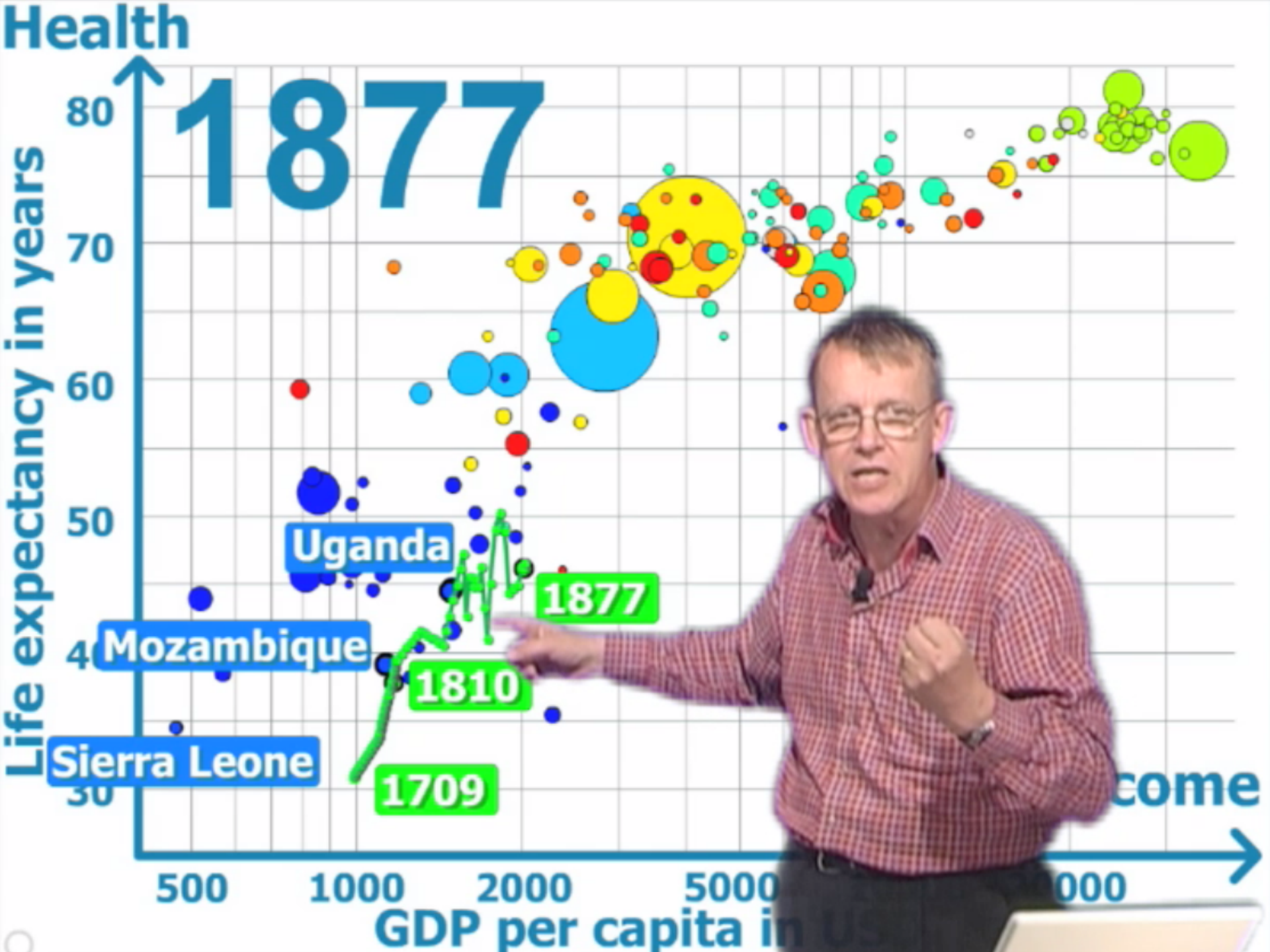




English translation: Claes Johansson, UNDP

1 2 3 4 5 6 7 8 9

Start


Health
1877
80
70
60
50
40
30
Life expectancy in years
Uganda
1877
Mozambique
1810
Sierra Leone
1709
500
1000
2000
5000
come
GDP per capita in

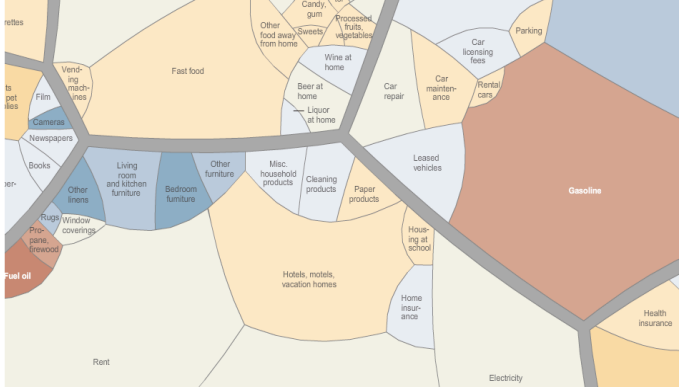
lifespan
75 years
50 years
25 years
2009
income
$400
$4 000
$40 000
Narrator
Holograms?

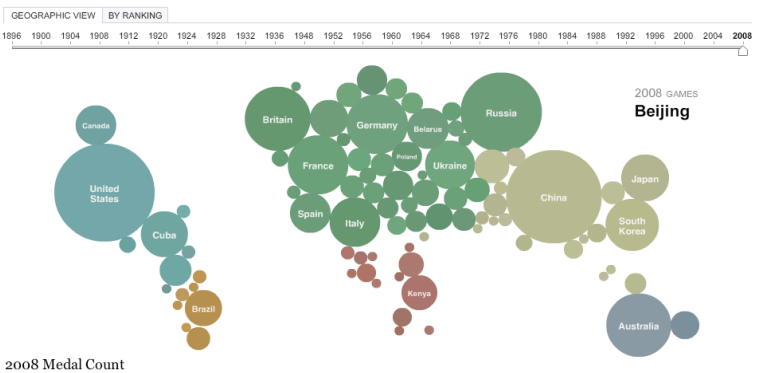
Narrative Devices for Storytelling with Data

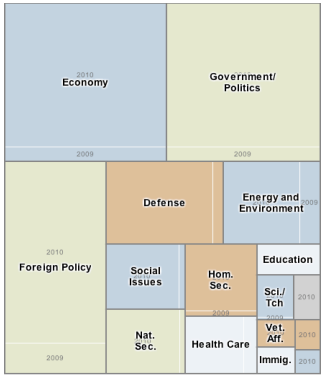
What devices communicate effectively?

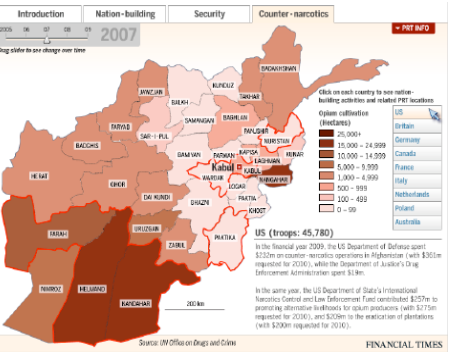
... for which contexts and audiences?

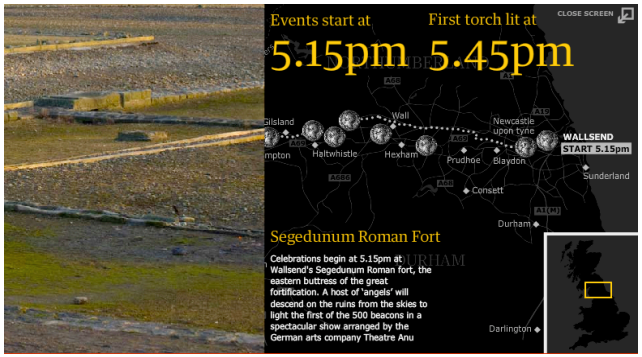
Narrative Visualization Design Space

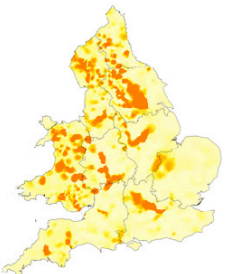


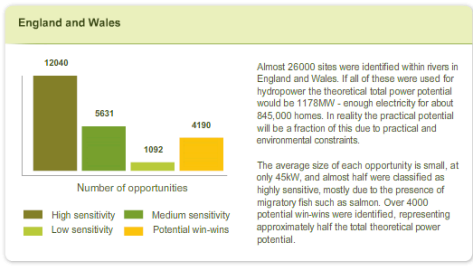












58

CASE STUDIES

70% Journalism
20% Business
10% Research

755

Grab attention with image and position

Cumulative home runs.

Hank Aaron
755 homers
23 seasons

Babe Ruth
714 homers
22 seasons

Barry Bonds
708 homers
20 seasons

Bonds takes lead
Home runs after 16 seasons

Bonds	567
Aaron	554
Ruth	516

400

200

0

14th

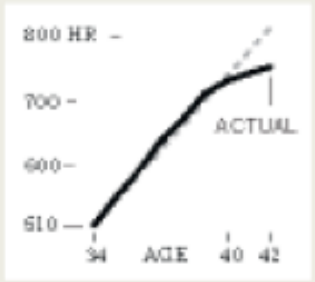
Reduced visual priority

Homer Pace After Age 34

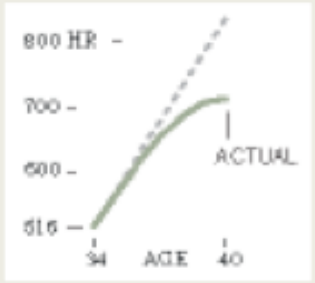
If the accusations are correct, Bonds was 34 in his first season on steroids. Here are projected home run paces for each player after age 34.

PROJECTED PACE BASED ON AVERAGE OF PREVIOUS FIVE SEASONS

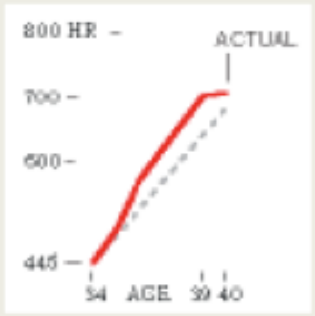
Aaron
Actual homers slightly outpace projected homers for five seasons.



Ruth
Averaged 46.4 homers a season from age 30 to 34. Averaged 42.5 for next four seasons.

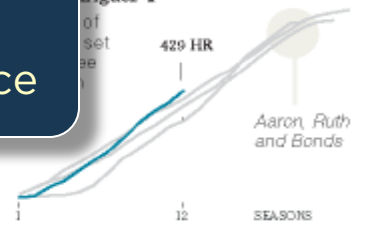


Bonds
From age 35 to 39, he averaged 14 more homers a season than projected.

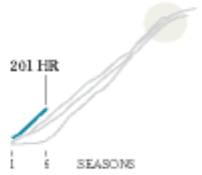


Note: Ages as of July 1 of each season.

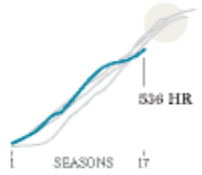
Others Taking Aim



Albert Pujols
Averaging 40 homers a season, he has started stronger than the three leaders did.

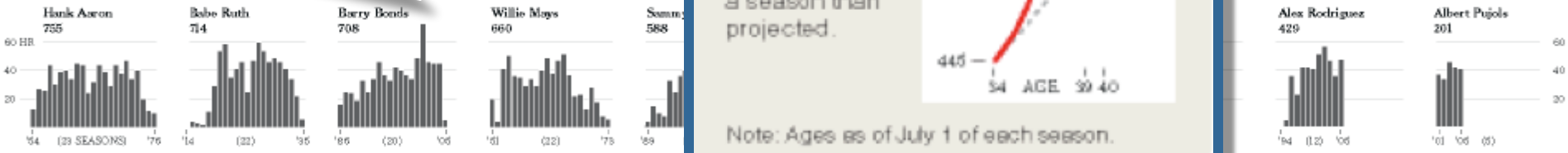


Ken Griffey Jr.
Many thought he would be the first to catch Ruth and Aaron until injuries limited his output.



Differing Paths to the Top of the ...s

The top seven players on the career h... (257th).



15 times hit 30 or more (M.L. most).

Hit only 20 over first five seasons.

Averaged 52 from 2000 to 2004.

No one hit more from 1950-69.

Three ... seasons is record. (49, 122, .316). ... a season. ... more in the 90's.

Youngest to reach 400 homers.

Second most ever in first five seasons.

Amanda Cox and Joe Ward/The New York Times

Beginning

755

Steroids or Not, the Pursuit Is On

Barry Bonds is taking aim at the career home run record. He needs only six more to tie Babe Ruth and 47 to equal Hank Aaron.

Hank Aaron
755 homers
23 seasons

Babe Ruth
714 homers
22 seasons

Barry Bonds
708 homers
20 seasons

Bonds takes lead
Home runs after 16 seasons

Bonds	567
Aaron	554
Ruth	514

23 seasons
22 seasons
20 seasons

Bonds was injured last season. He played 14 games and hit 6 homers.

14th season

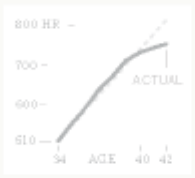
According to allegations in a book about Bonds, he began taking steroids before the 1999 season, his 14th in the league. Two seasons later, he hit 73 home runs, surpassing Aaron's career pace.

Homer Pace After Age 34

If the accusations are correct, Bonds was 34 in his first season on steroids. Here are projected home run paces for each player after age 34.

PROJECTED PACE BASED ON AVERAGE OF PREVIOUS FIVE SEASONS

Aaron
Actual homers slightly outpace projected homers for five seasons.

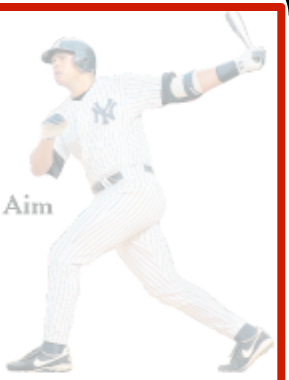


Ruth
Averaged 46.4 homers a season from age 30 to 34. Averaged 42.5 for next four seasons.

Bonds
From age 35 to 39, he averaged 14 more homers a season than projected.

5 seasons
10
15

Middle



Others Taking Aim

Alex Rodriguez ▲
Is ahead of the pace set by all three home run leaders.

Albert Pujols
Averaging 40 homers a season, he has started stronger than the three leaders did.

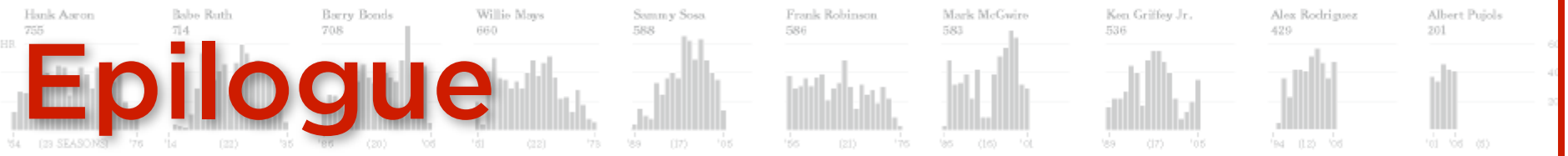
Ken Griffey Jr.
Many thought he would be the one to catch Ruth and Aaron until injuries limited his output.

End

Epilogue

Differing Paths to the Top of the Charts

The top seven players on the career home run list, along with a look at Griffey (12th), Rodriguez (3?th) and Pujols (tied 25?th).



15 times hit 30 or more (M.L. most).

Hit only 20 over first five seasons.

Averaged 52 from 2000 to 2004.

No one hit more from 1950-69.

Three 60-homer seasons is record.

Triple Crown in '66 (49, 122, .316).

First to hit 70 in a season.

Only McGwire had more in the 90's.

Youngest to reach 400 homers.

Second most ever in first five seasons.

Establishing Shot

Development Trends 2005

Checklist Structure

Interactive presentation of some of the messages in the Human Development Report

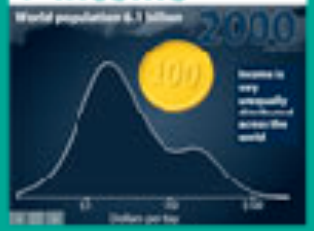
English
Dansk
Portuguese
Suomi
Français
Deutsch

Produced in collaboration with:

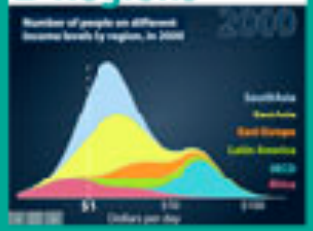
der.org

English translation: Claes Johansson, UNDP

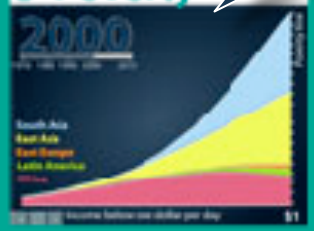
1 Income



2 Regions

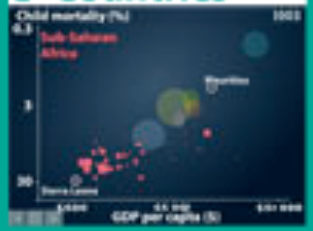


3 Poverty

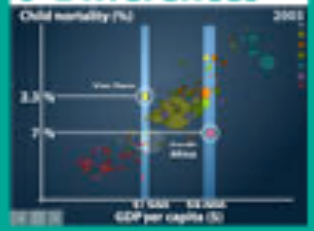


4 Health

5 Countries



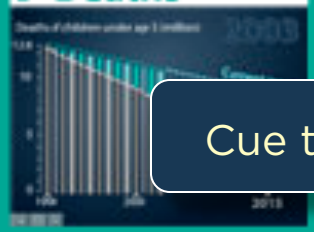
6 Differences



7 Trends

8 Gaps

9 Deaths



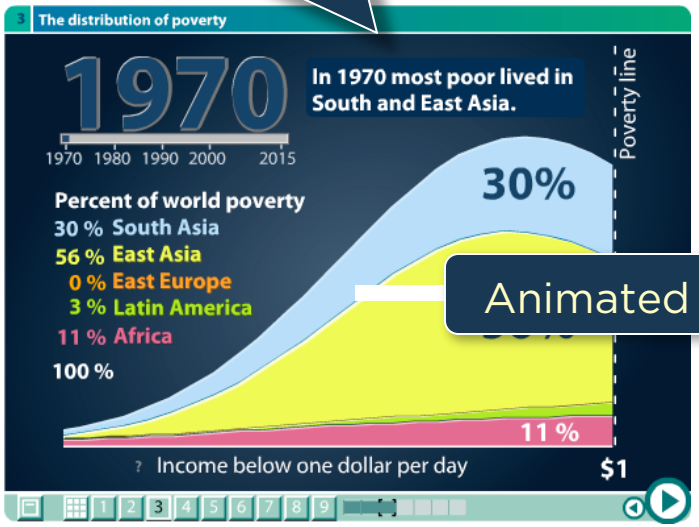
Progress Bar

1 2 3 4 5 6 7 8 9

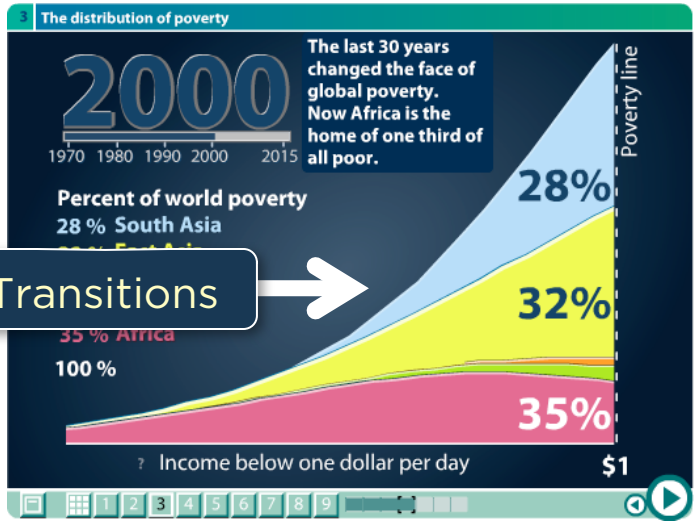
Cue to Action

Start

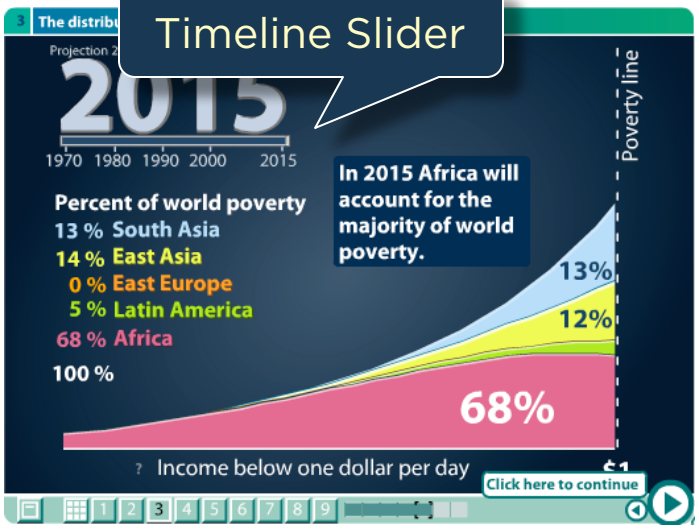
Annotations Tell Story

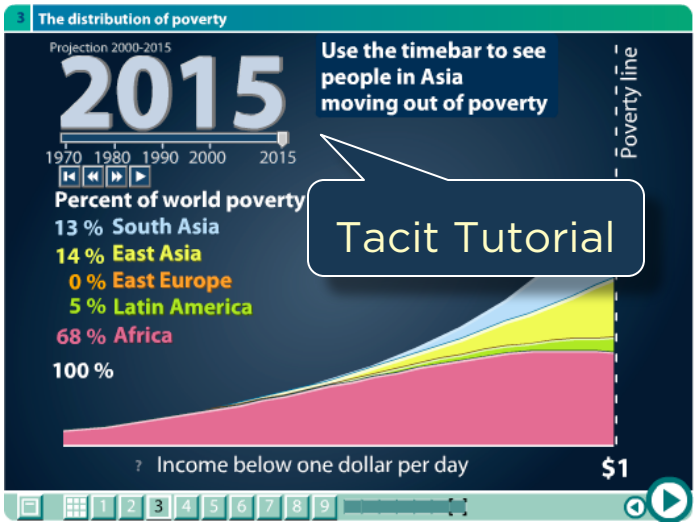


Animated Transitions



Timeline Slider





Tacit Tutorial

Interactive Slide Show

Budget 2010: reaction from around the UK

People in key constituencies around the country give their responses to Alistair Darling's budget

Introductory Text

Consistent Visual Platform

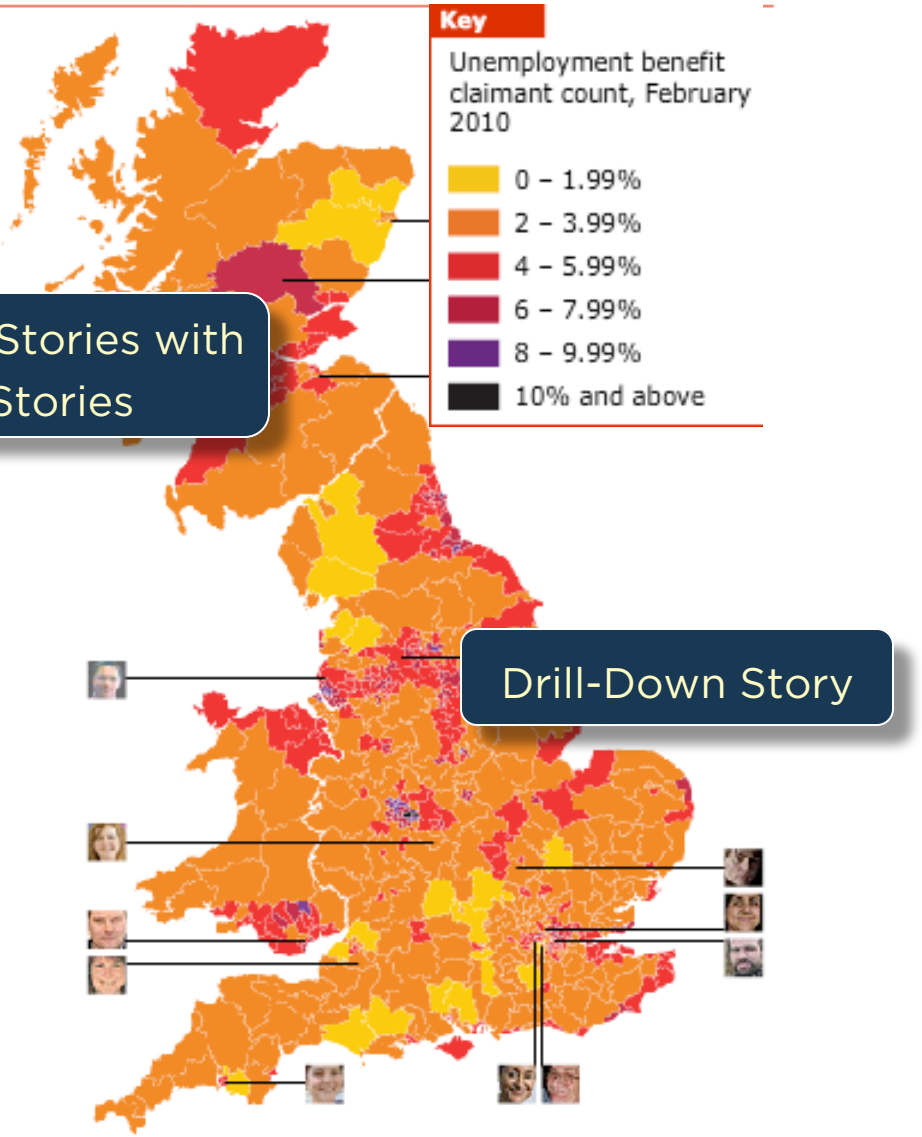
ny Ridley and Carly Lev
Wednesday 24 March 2010 15.00 GMT

mith and Fulham

Shilpa Wymer, 40, is managing direc two branches of Pitman Training Ltd, a training school specialising in secretarial and PA training

Enquiries from individuals suddenly dropped off a cliff from October 2008 and in January last year we had to lay off a couple of people, though things have picked up since. The budget seems very positive and shows the government are thinking about small and medium sized businesses at last. I think the measures will help businesses be more confident, which will have a knock-on effect on us. It has turned my head and made me think about which way I will vote.

Anecdotal Stories with Data Stories

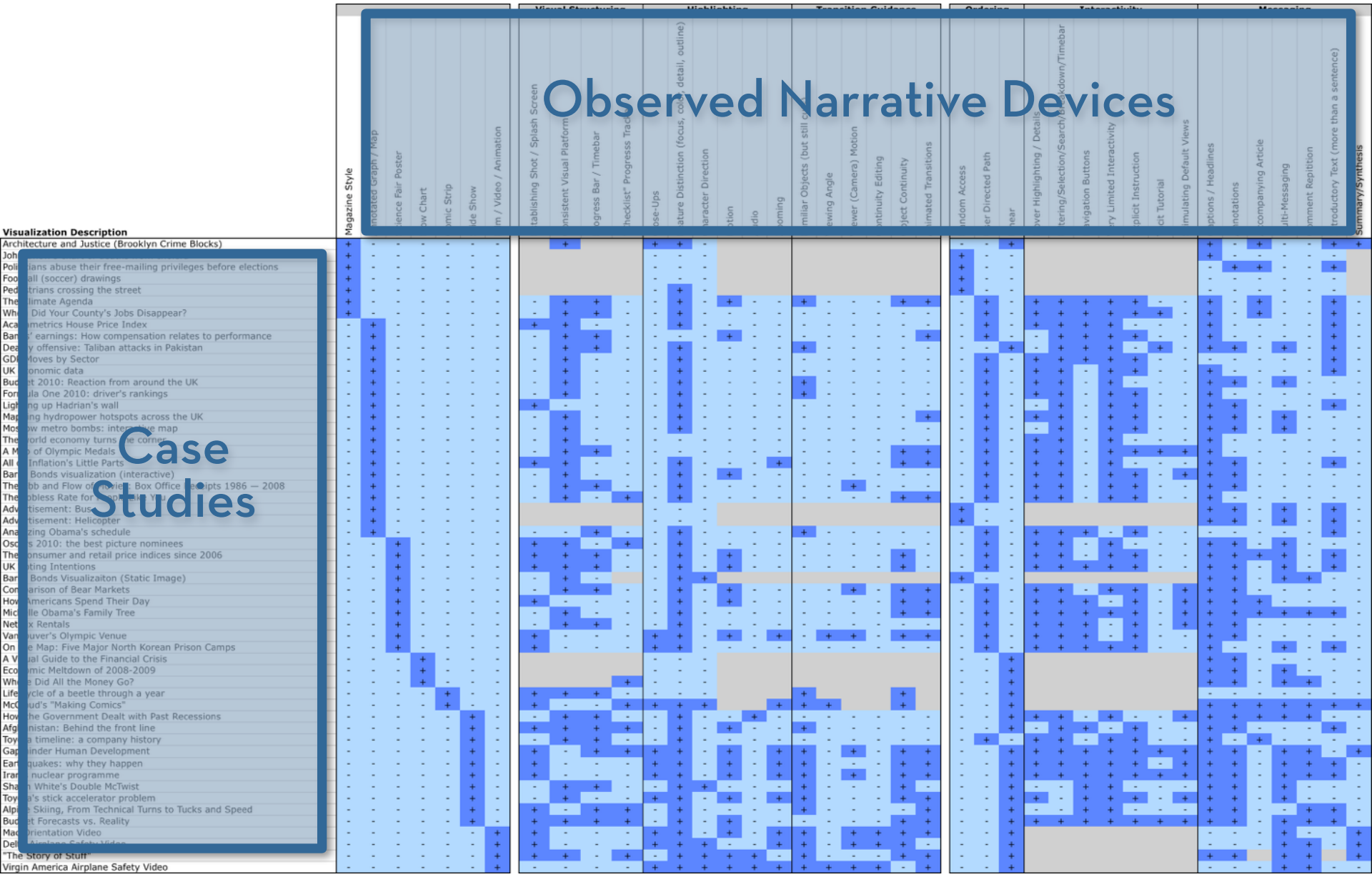


Drill-Down Story

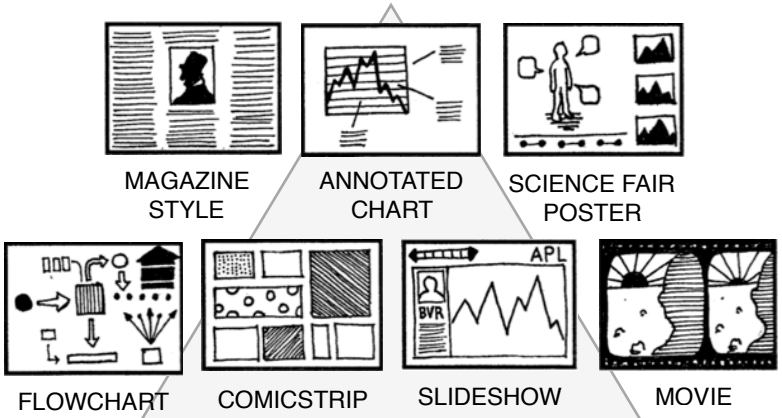
Constituency profile
MP: Greg Hands, Conservative. Majority: 5,029
Unemployment benefit claimants, Feb 2010: 3,281 (up 13% over last year)

Observed Narrative Devices

Case Studies



Visual Design



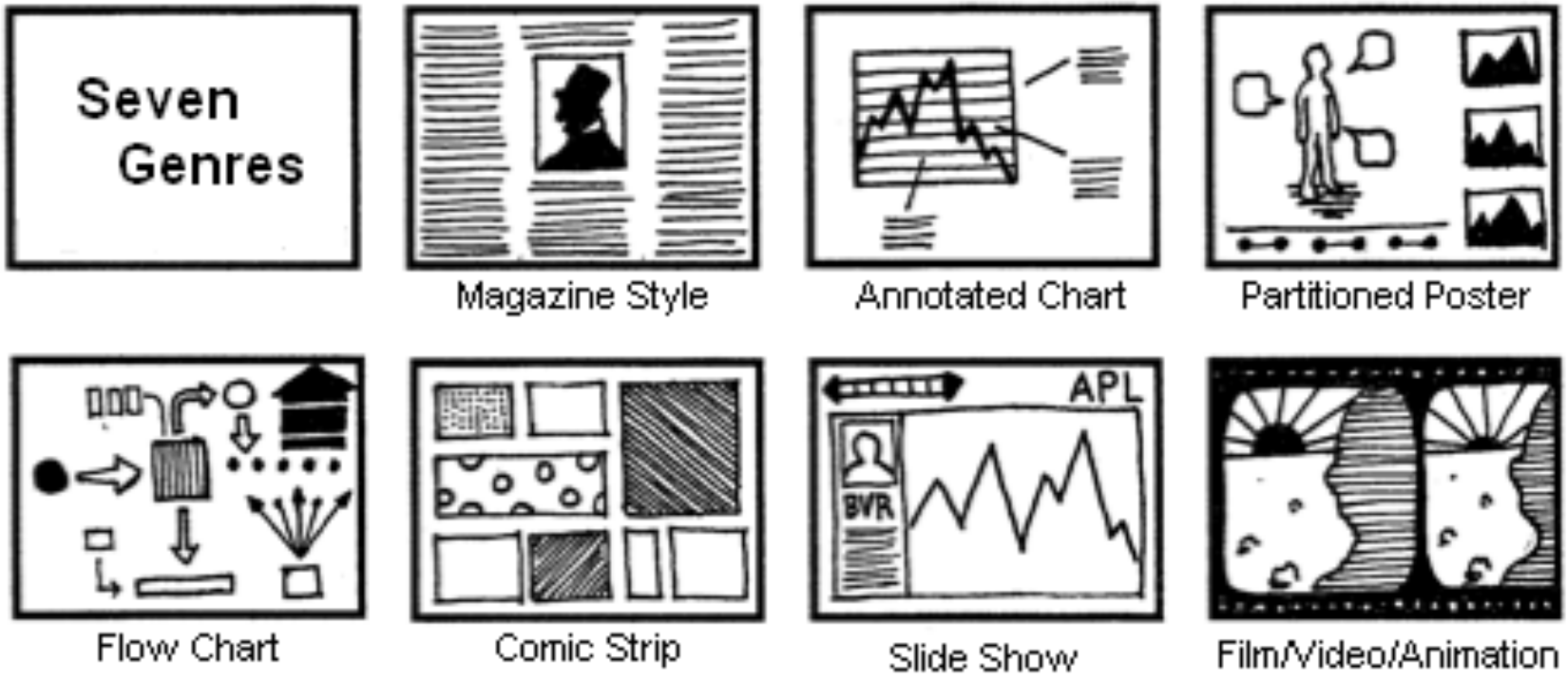
Duo-Specific
Captions
Annotations
Attached Article
Summaries
Interpret
Headlines

Tacit Tutorial
Selection
Navigation
Details on Demand
Timelines
Filtering
Highlighting

Messaging

Interactivity

MORE



Genres for Narrative Visualization (2010)

Missing "scrolly-telling" designs…

Genres + Interactivity + Messaging =

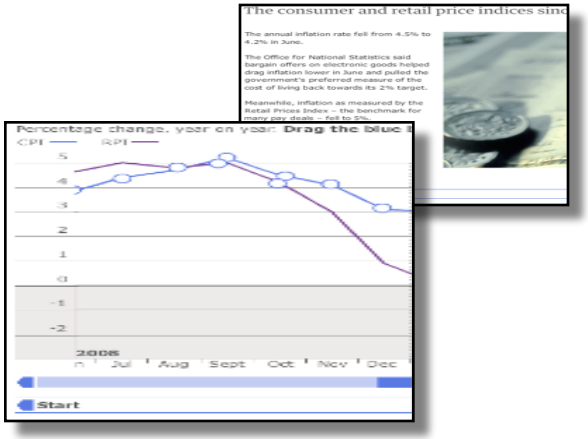
DESIGN SPACE

STORYTELLING	**Author Driven** strong ordering heavy messaging limited interactivity	**Reader Driven** weak ordering light messaging free interactivity
CLARITY		
SPEED		

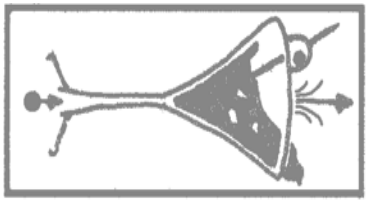
ASK QUESTIONS

EXPLORE

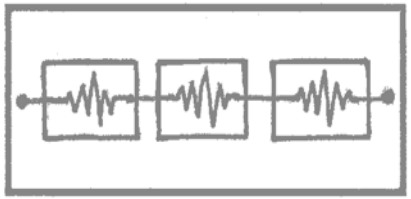
FIND



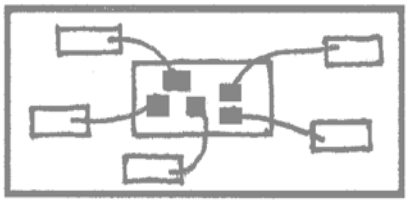
martini glass



interactive slideshow



drill-down story



Interactive Documents: Steppers, Scrollers, …

Published: February 2, 2010

Budget Forecasts, Compared With Reality

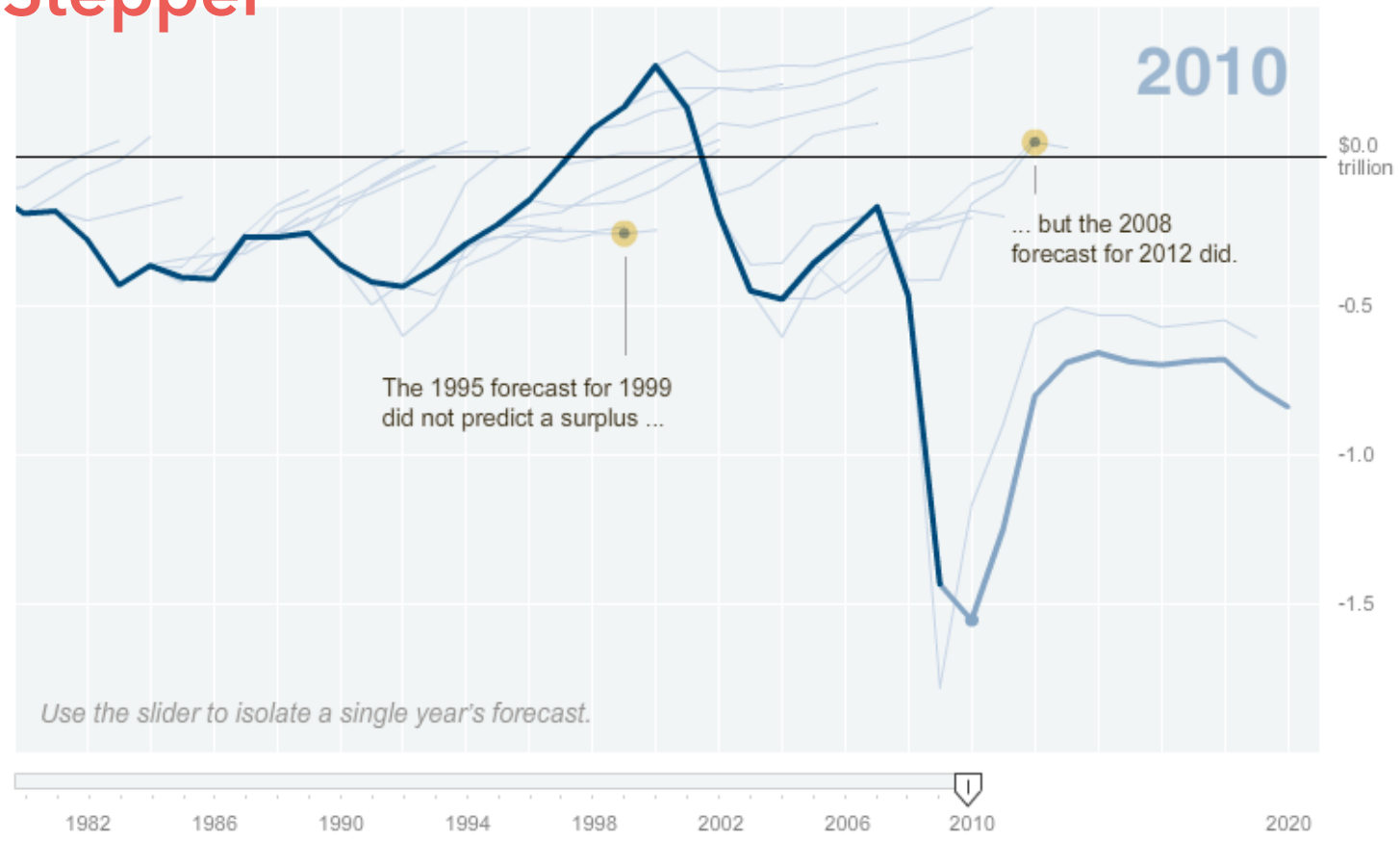
Just two years ago, surpluses were predicted by 2012. How accurate have past White House budget forecasts been?

1 | 2 | 3 | 4 | 5 | 6 | NEXT ▶

Stepper

Latest forecast

Today, with a better understanding of the severity of the economic downturn, the deficit situation is much more dire.



NY Times
2014

Ramadi: The Government Provides an Opening for ISIS

ISIS Control

Tensions between this city's residents, who are mostly Sunni, and the central government had been brewing here for at least a year. Then in December, Iraq's prime minister, Nuri Kamal al-Maliki, ordered security forces to dismantle a protest camp — an outlet for disenchanted Sunnis angered at their treatment by the Shiite-dominated government. The action ignited days of violence and created the opening ISIS needed to seize parts of the city, the provincial capital.

Falluja: A Symbolic Fall

ISIS Control

Just days after the raid on the camp in Ramadi, ISIS fighters destroyed the Police Headquarters and mayor's office here, planted their flag on government buildings and decreed the city to be theirs. Ten years earlier, American forces had captured this city from Qaeda-style insurgents at a considerable cost of American lives.

Scroll

R2
D3

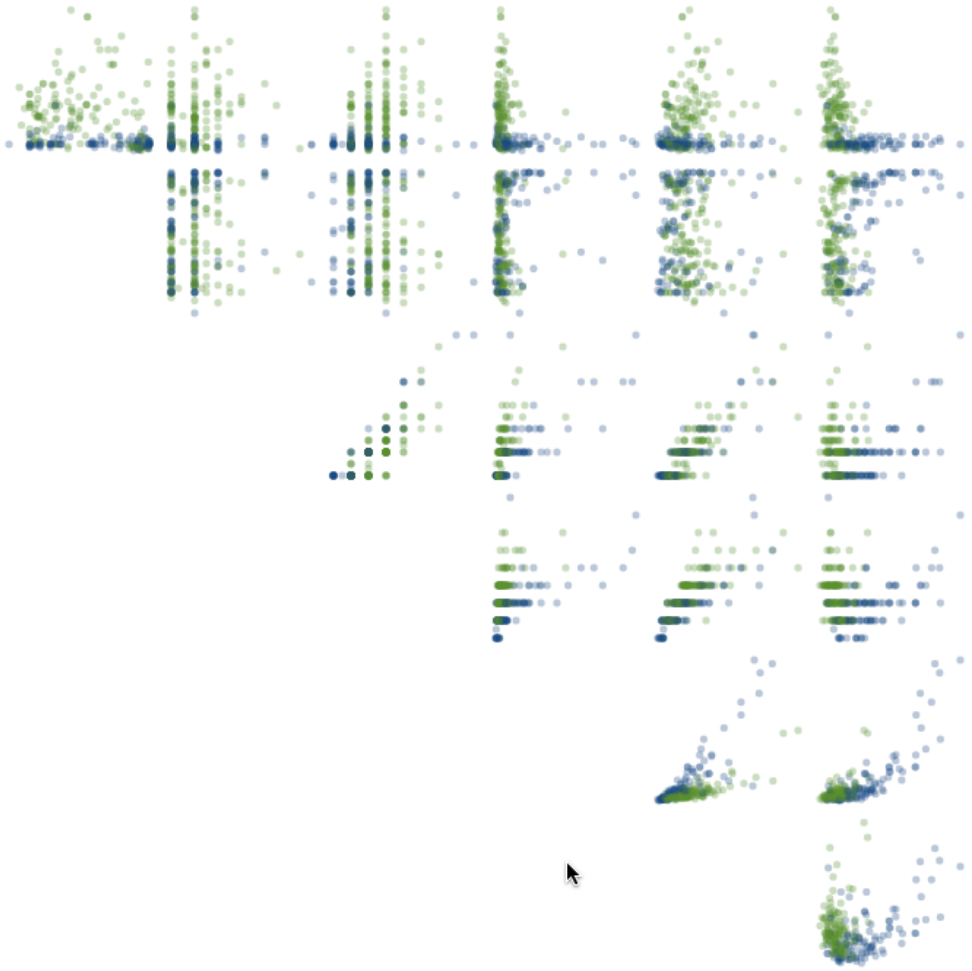
A visual introduction to machine learning

English

In machine learning, computers apply **statistical learning** techniques to automatically identify patterns in data. These techniques can be used to make highly accurate predictions.

Keep scrolling. Using a data set about homes, we will create a machine learning model to distinguish homes in New York from homes in San Francisco.

SCROLL



Discrete step vs. Continuous scroll

Different means for narrative navigation.
A source of debate among practitioners!

Discrete step vs. Continuous scroll

Different means for narrative navigation.
A source of debate among practitioners!

Step: sequential frames as in a slideshow
Simple and familiar, but less engaging?

Discrete step vs. Continuous scroll

Different means for narrative navigation.
A source of debate among practitioners!

Step: sequential frames as in a slideshow
Simple and familiar, but less engaging?

Scroll: continuous navigation of page
Parameterize content by scroll position
May cause usability / scrolljacking issues

Discrete step vs. Continuous scroll

Different means for narrative navigation.
A source of debate among practitioners!

Step: sequential frames as in a slideshow
Simple and familiar, but less engaging?

Scroll: continuous navigation of page
Parameterize content by scroll position
May cause usability / scrolljacking issues

Hybrids: scroller with discrete sections

Narrative Implementation

Do-It-Yourself

Monitor scroll position & element positions

Guidance: M. Bostock, J. Vallandingham

Third-Party Support

Helper Libraries

Interactive Document Formats: Idyll

idyll

Overview

- **Introduction**
- Getting started
- Syntax
- Configuration and styles

Components

- Overview
- Built-in components
- Custom components
- Refs

Publishing

- Deploying to the web

Open Source

- GitHub

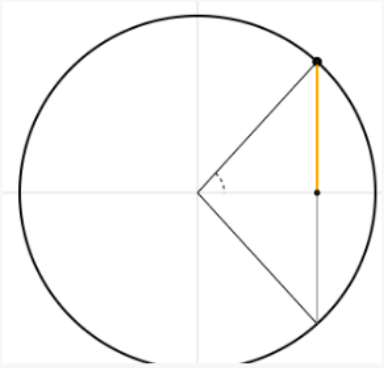
Introducing Idyll

Idyll is a tool that makes it easier to author interactive narratives for the web. The goal of the project is to provide a friendly markup language — and an associated toolchain — that can be used to create dynamic, text-driven web pages.

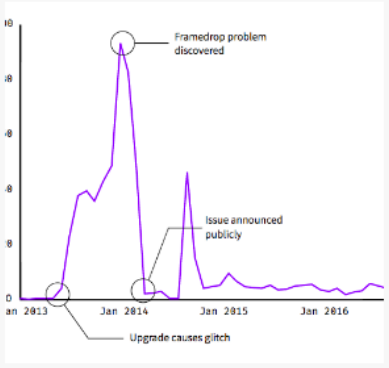
Idyll helps you create documents that use common narrative techniques such as embedding interactive charts and graphs, responding to scroll events, and explorable explanations. Additionally, its readable syntax facilitates collaboration between writers, editors, designers, and programmers on complex projects.

Examples

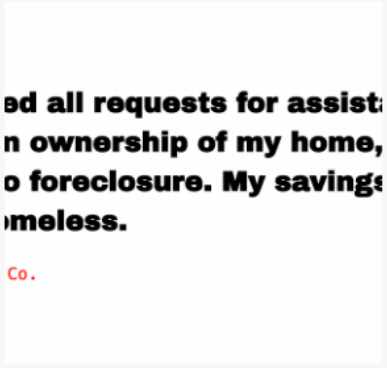
Full Articles



The Etymology of Trig Functions

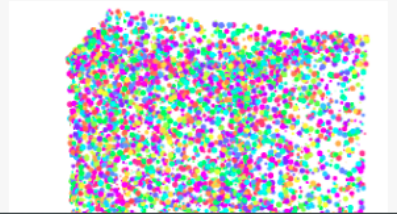


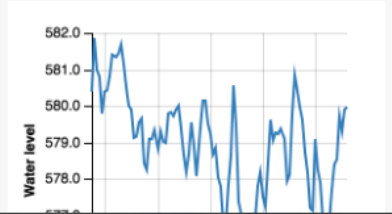
Seattle PD's Dashcam Problem



The United Complaints of America

With Popular JavaScript Libraries





The Etymology of Trig Functions

By: Matthew Conlen

Ed. Note: Mouseover the blue links to see concepts demonstrated visually.

You may have learned about trigonometric functions such as **sine** and **cosine** as being defined by the ratios of sides of a triangle (*SOHCAHTOA*), or in terms of points and lines related to the unit circle. For me, it didn't totally click until I started to think visually about inscribing a triangle inside of a circle.

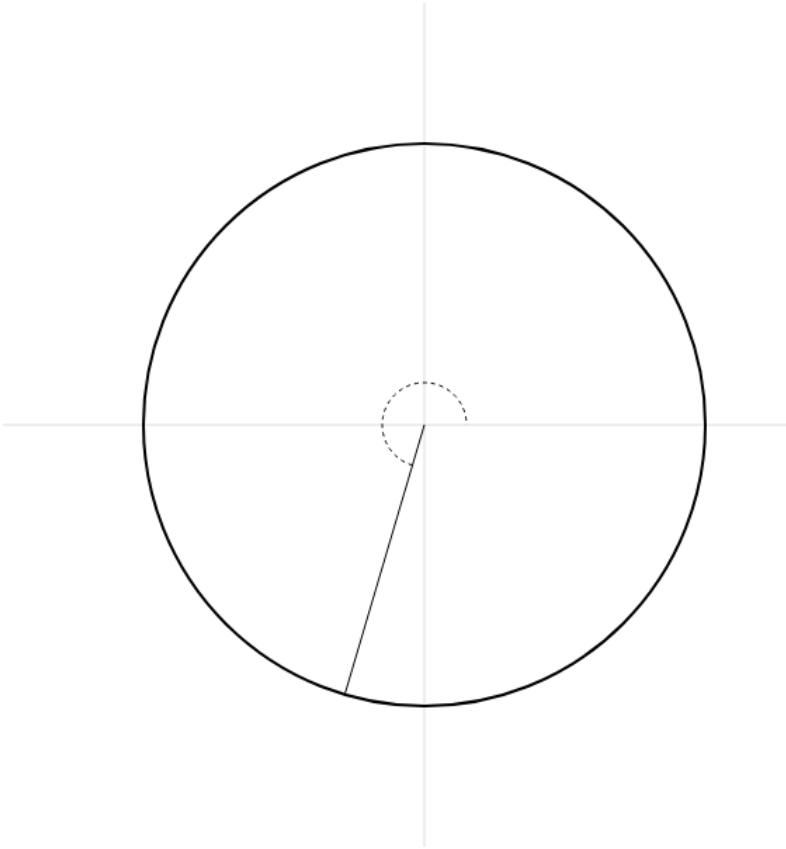
For example, you can think about the sine function as measuring the distance from the x-axis of a point on the unit circle at a particular angle. The sign (+/-) of that value indicates if the point lies above or below the axis. Similarly the cosine can be thought of as measuring the distance from the y-axis of that same point.

It is useful to note that the cosine of an angle is the same as the sine of the complement of the angle. In other words, it is the same operation as sine, just with respect to the y-axis instead of the x-axis.

The word *sine* originally came from the latin *sinus*, meaning "bay" or "inlet". However, it had a long path to get there. The earliest known reference to the sine function is from Aryabhata the Elder, who used both *ardha-jya* (half-chord) and *jya* (chord) to mean *sine* in Aryabhatiya, a Sanskrit text finished in 499 CE.

Jya, meaning chord, became *jiba* in Arabic, and was abbreviated as just *jb*. When the term was translated to latin in the twelfth century, *jb* was incorrectly read as *jaib* (meaning "bay" or "inlet"), and thus translated as *sinus*.

The sine function has a direct connection to chords on a circle. Pick two points on the unit circle, then the length of the line connecting the two points is exactly twice the value of the sine of half the anlge between them. That is, `chord_length(θ) / 2 = sin(θ / 2)`.



sin(-1.86) = -0.9590 cos(-1.86) = -0.2833

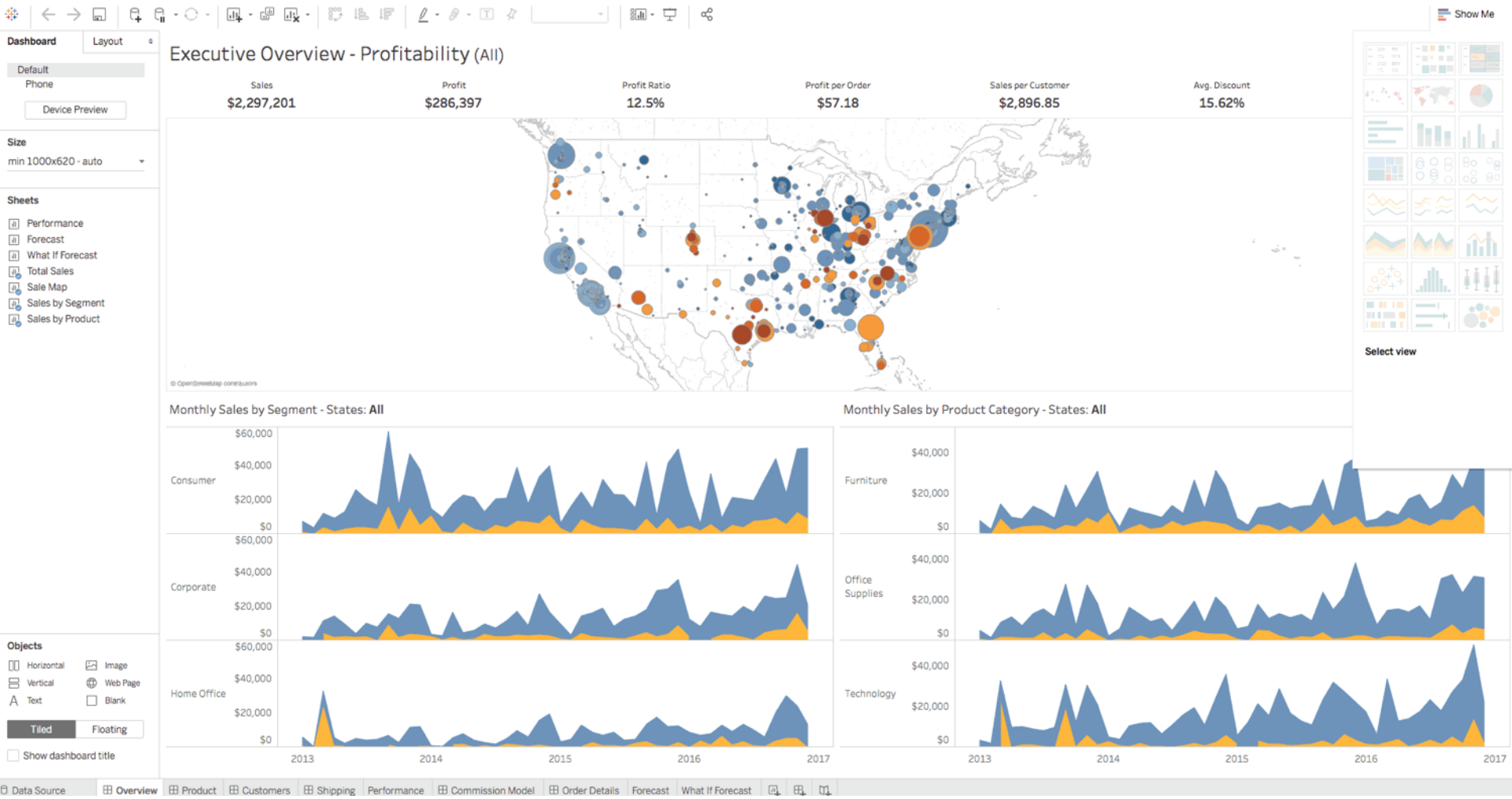
tan(-1.86) = 3.3851 cotan(-1.86) = 0.2954

sec(-1.86) = -3.5297 cosec(-1.86) = -1.0427

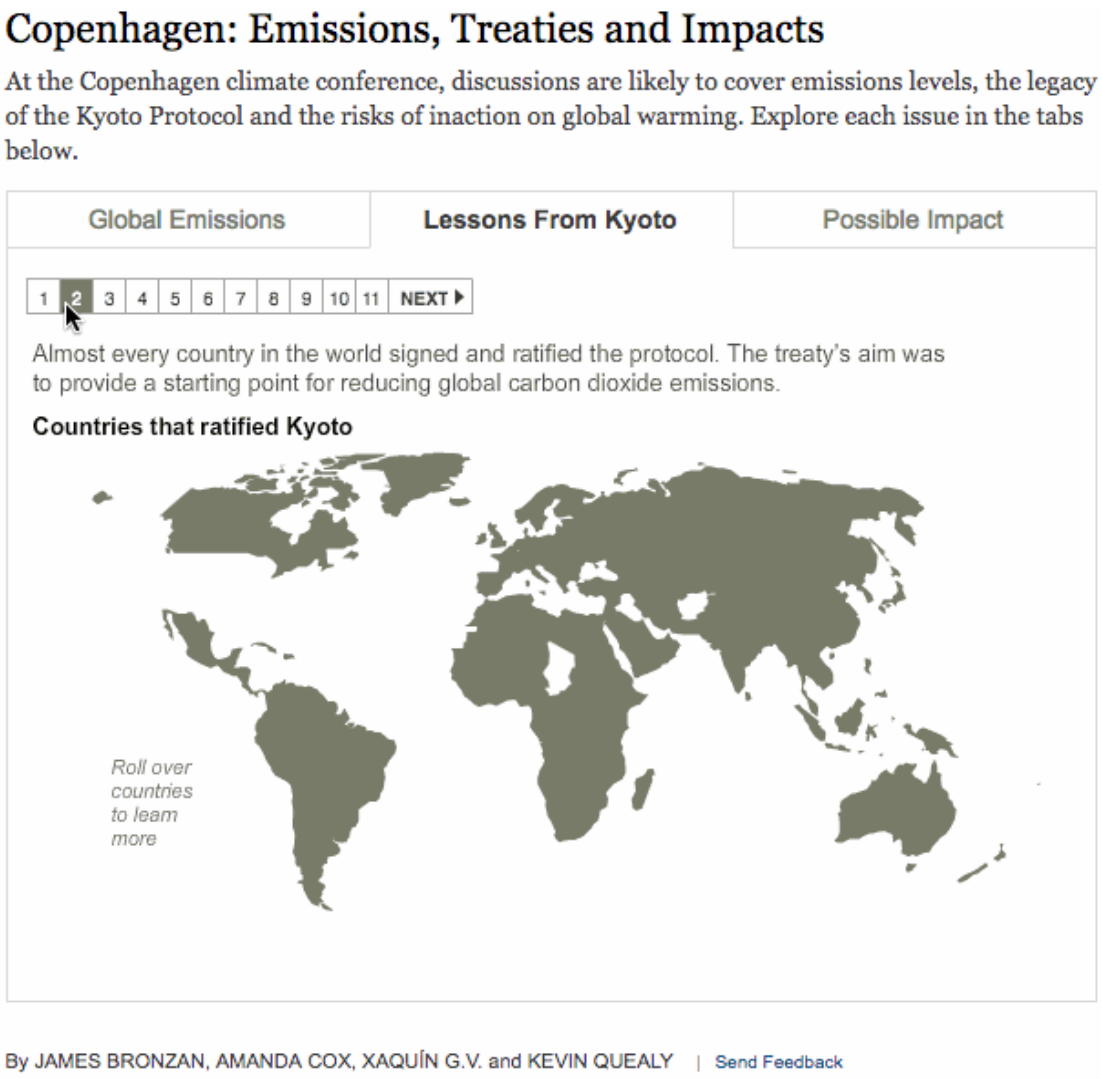
CLICK TO SELECT ANGLE OR FUNCTION

Chart Sequence Models

Multiple Charts in Data Analysis



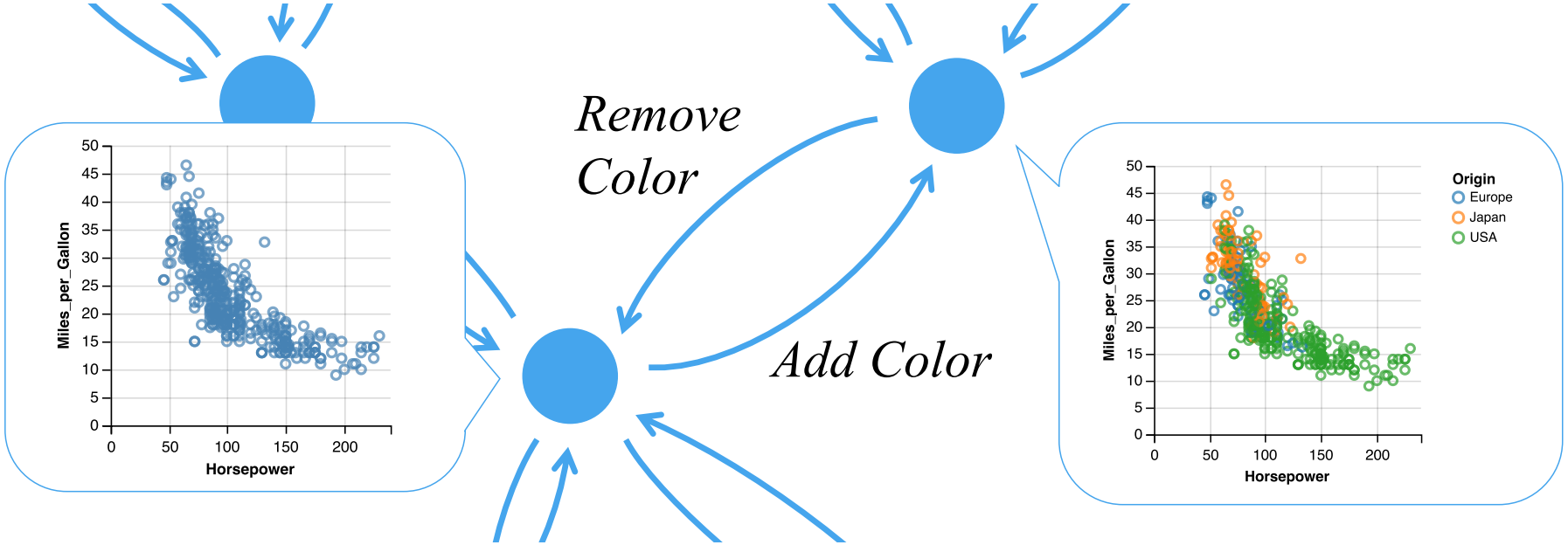
Multiple Charts in Story Telling



In many cases, data is conveyed via a sequence of charts.

How might we evaluate different orderings of visualizations?

GraphScape: A Directed Graph Model

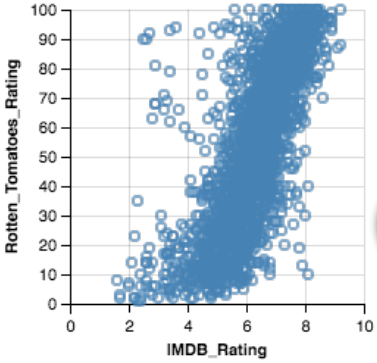


Nodes are **Vega-Lite specifications**. Edges represent **edit operations**, weighted by estimated **transition costs**.

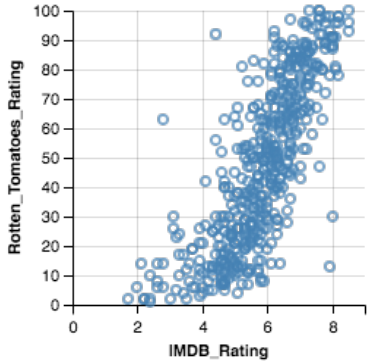
[Kim, Wongsuphasawat, Hullman, Heer, CHI'17]

Design Alternatives

"Too many data points !"



Random Sample

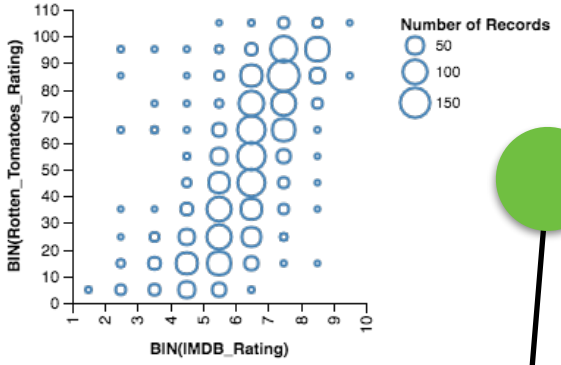


Add Filter

Bin

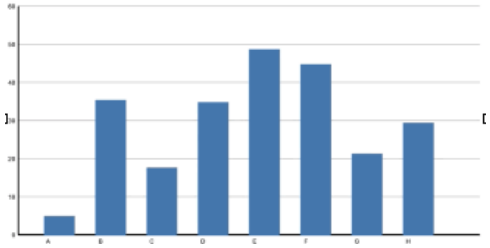
Bin

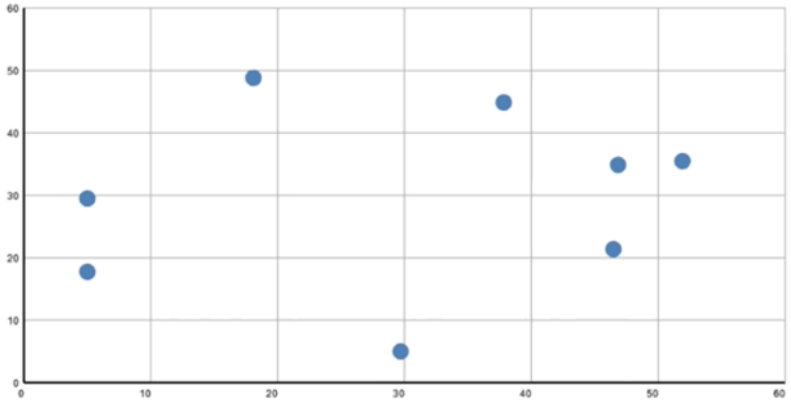
Binned Scatter Plot



Add Size(count)

Path Elaboration

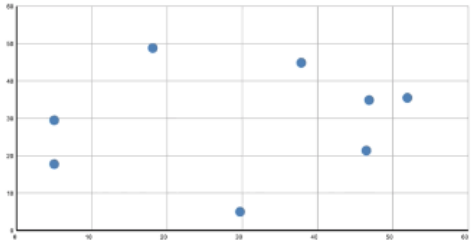




$P_{A \rightarrow B}$

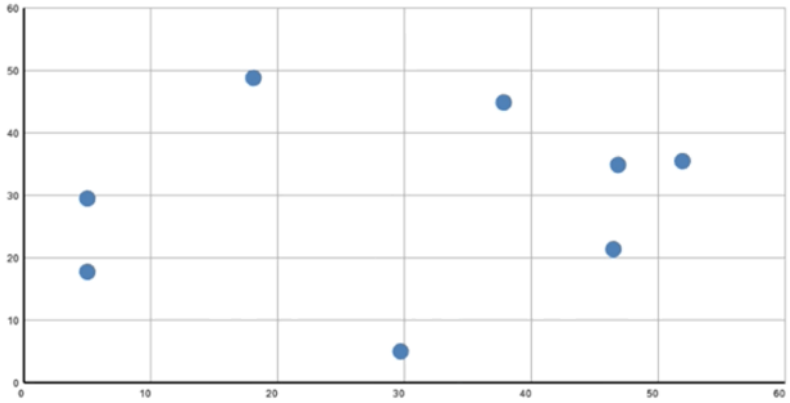
B

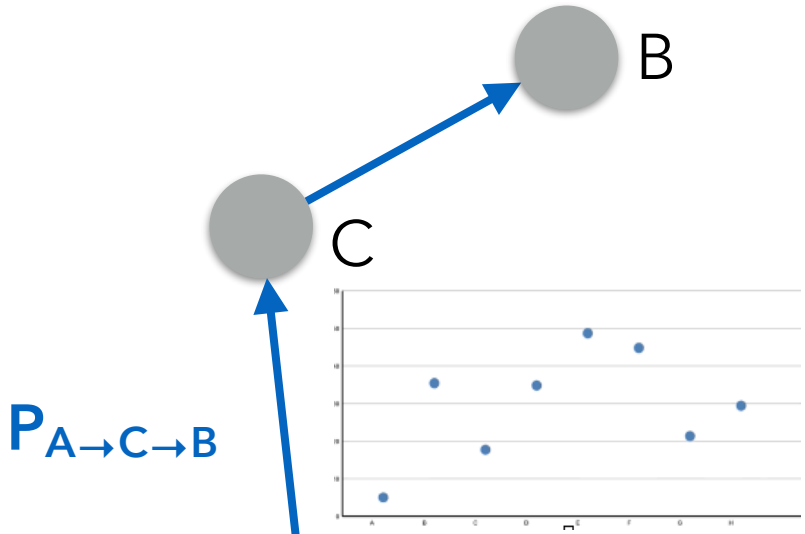
A



Heer, Jeffrey and George G. Robertson.
"Animated Transitions in Statistical Data Graphics." *IEEE Trans. Vis. Comput. Graph.* 13 (2007): 1240-1247.

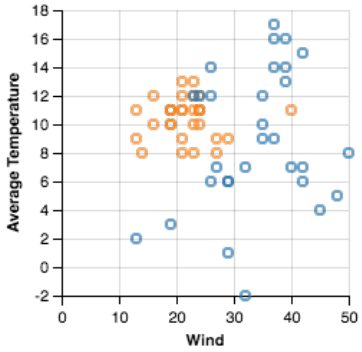
Path Elaboration

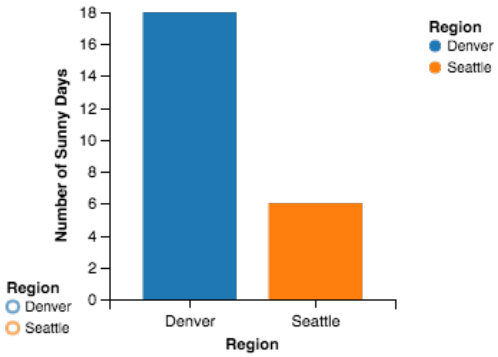


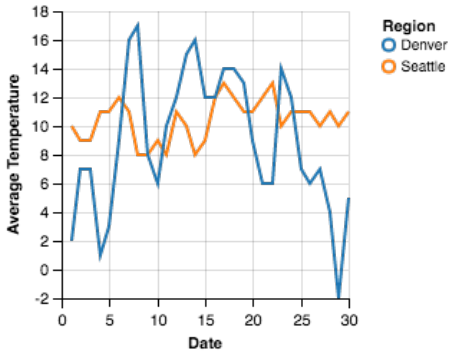


Heer, Jeffrey and George G. Robertson.
"Animated Transitions in Statistical Data Graphics." *IEEE Trans. Vis. Comput. Graph.* 13 (2007): 1240-1247.

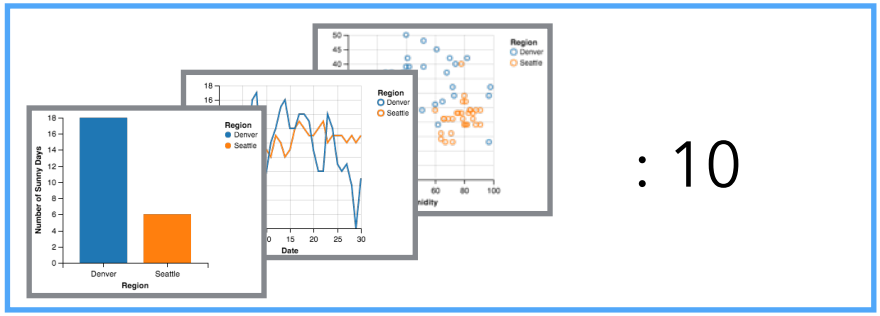
Sequence Recommendation

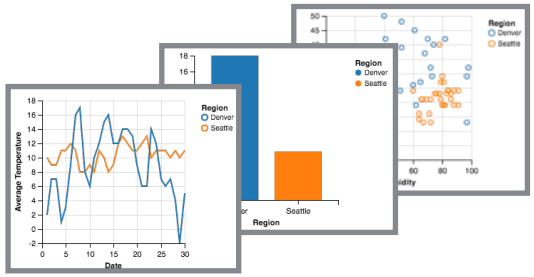


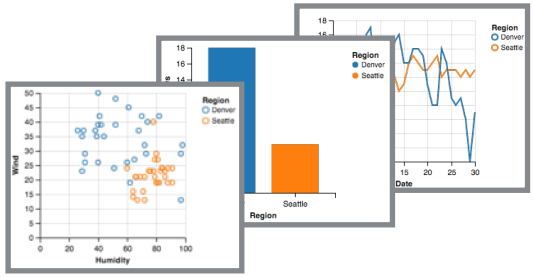




Sequence Cost







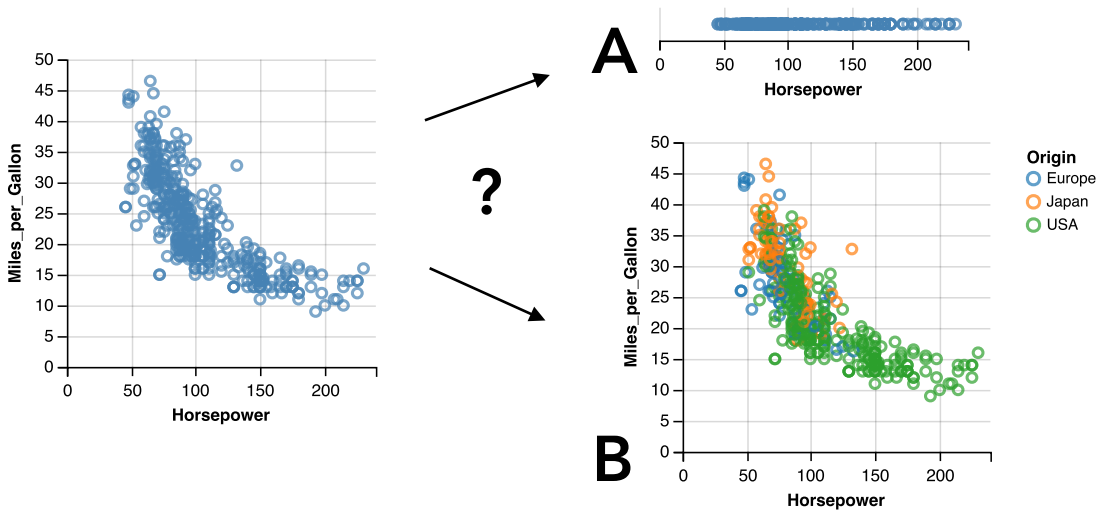
...

Learning Edge Weights

Given a **reference chart**, what should come **next**?

Triplet judgments express **inequalities** among edits.

We encode these in a linear program. The solution gives us **cost estimates** for each edit operation type.



Asks the question:

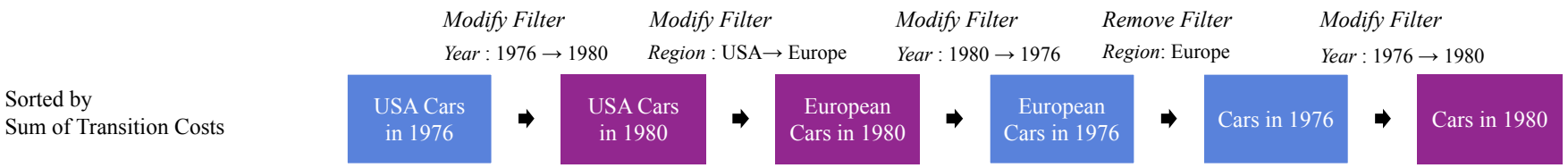
Is $Drop\ Field_y < Add\ Field_{color}$?

Sequence Cost Model

Chart Sequence

$Cost(S)$

) Cost


Sorted by
Sum of Transition Costs
Modify Filter
Year : 1976 → 1980
Modify Filter
Region : USA→ Europe
Modify Filter
Year : 1980 → 1976
Remove Filter
Region: Europe
Modify Filter
Year : 1976 → 1980
USA Cars in 1976
USA Cars in 1980
European Cars in 1980
European Cars in 1976
Cars in 1976
Cars in 1980

Sequence Cost Model

Chart Sequence

Transition (Edit Distance) Cost

$$Cost(S) = \sum_{i=1}^{|S|} T(S_{i-1}, S_i)$$

Sequence Cost Model

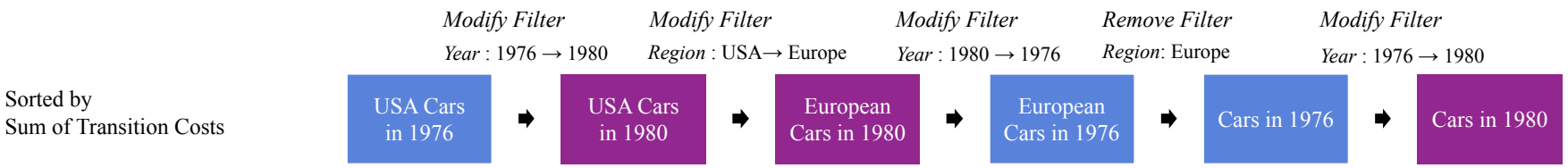
Chart Sequence

Transition (Edit Distance) Cost

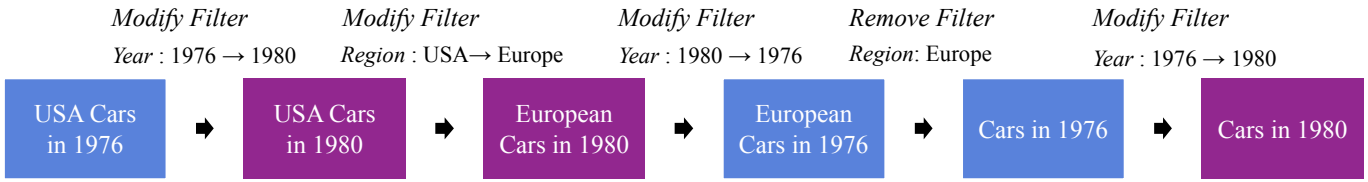
$$Cost(S) = W(S) \cdot \left(\sum_{i=1}^{|S|} T(S_{i-1}, S_i) + F(S) \right)$$

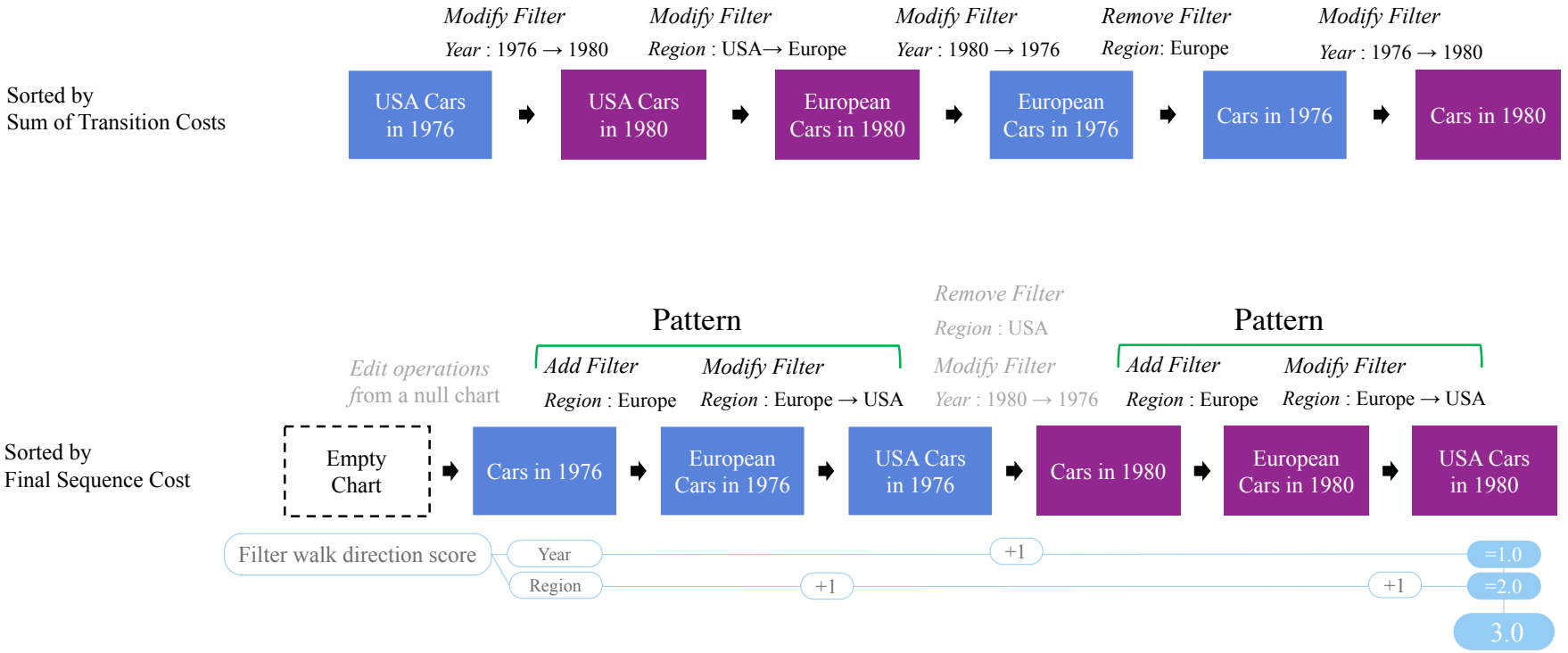
Consistency Weight

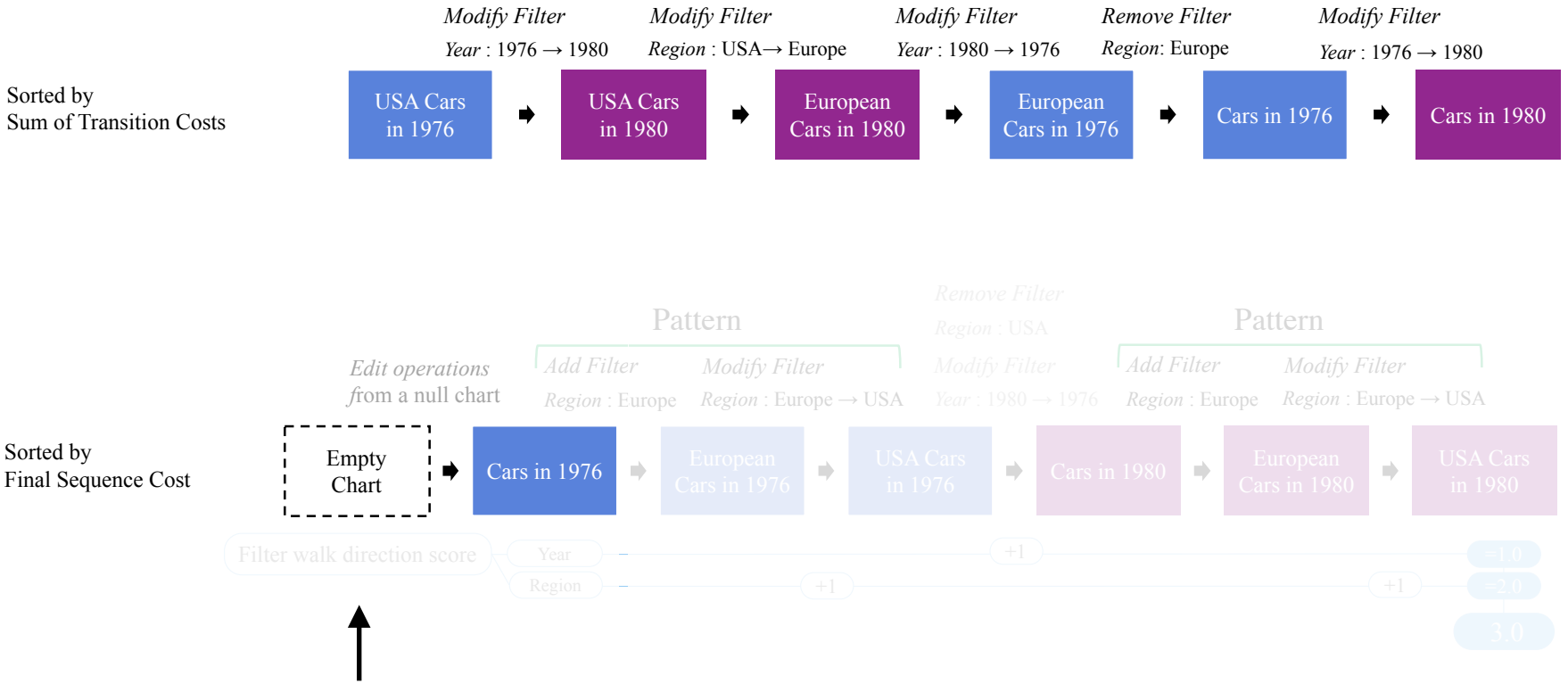
Filter Cost


Sorted by
Sum of Transition Costs
Modify Filter
Year : 1976 → 1980
Modify Filter
Region : USA→ Europe
Modify Filter
Year : 1980 → 1976
Remove Filter
Region: Europe
Modify Filter
Year : 1976 → 1980
USA Cars in 1976
USA Cars in 1980
European Cars in 1980
European Cars in 1976
Cars in 1976
Cars in 1980

Sorted by
Sum of Transition Costs

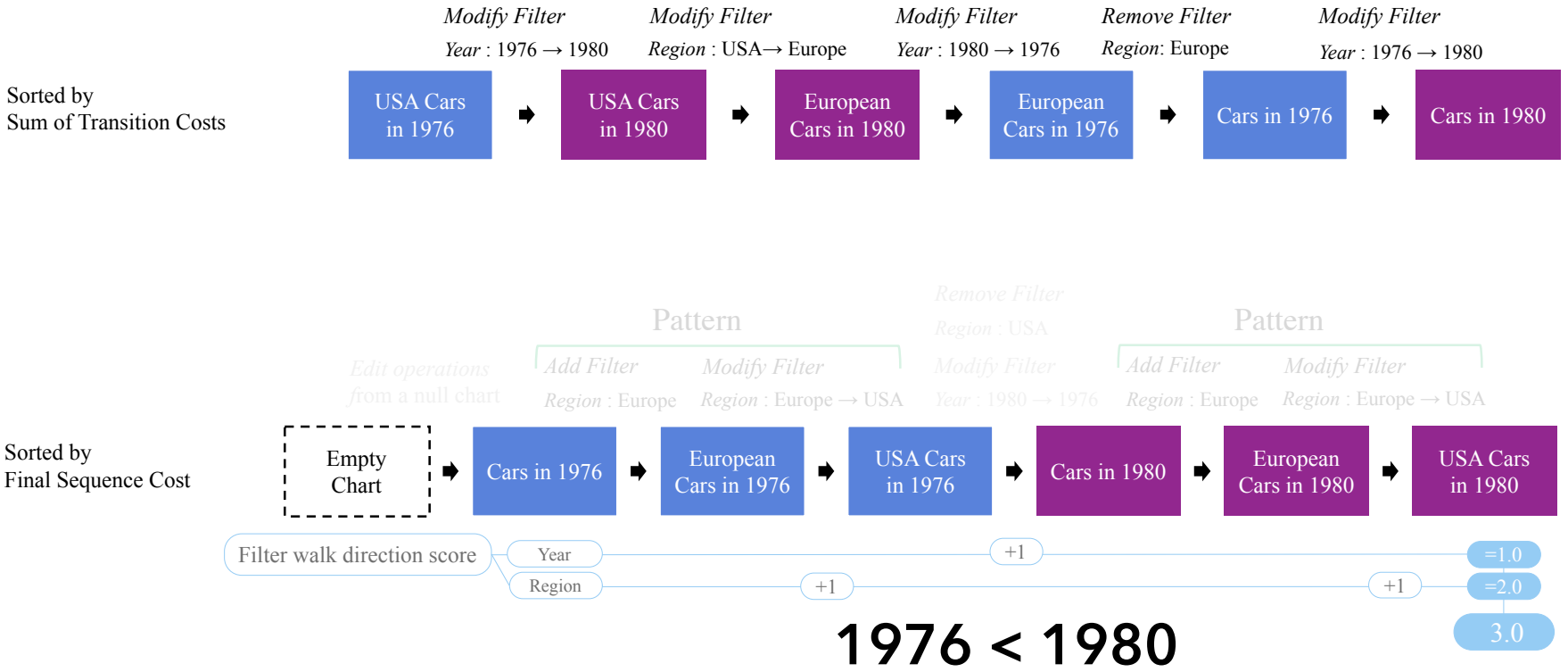



Sorted by
Sum of Transition Costs
Modify Filter
Year : 1976 → 1980
Modify Filter
Region : USA→ Europe
Modify Filter
Year : 1980 → 1976
Remove Filter
Region: Europe
Modify Filter
Year : 1976 → 1980
USA Cars in 1976
USA Cars in 1980
European Cars in 1980
European Cars in 1976
Cars in 1976
Cars in 1980
Sorted by
Final Sequence Cost
Edit operations from a null chart
Pattern
Add Filter
Region : Europe
Modify Filter
Region : Europe → USA
Remove Filter
Region : USA
Modify Filter
Year : 1980 → 1976
Pattern
Add Filter
Region : Europe
Modify Filter
Region : Europe → USA
Empty Chart
Cars in 1976
European Cars in 1976
USA Cars in 1976
Cars in 1980
European Cars in 1980
USA Cars in 1980
Filter walk direction score
Year
Region
+1
+1
+1
=1.0
=2.0
3.0



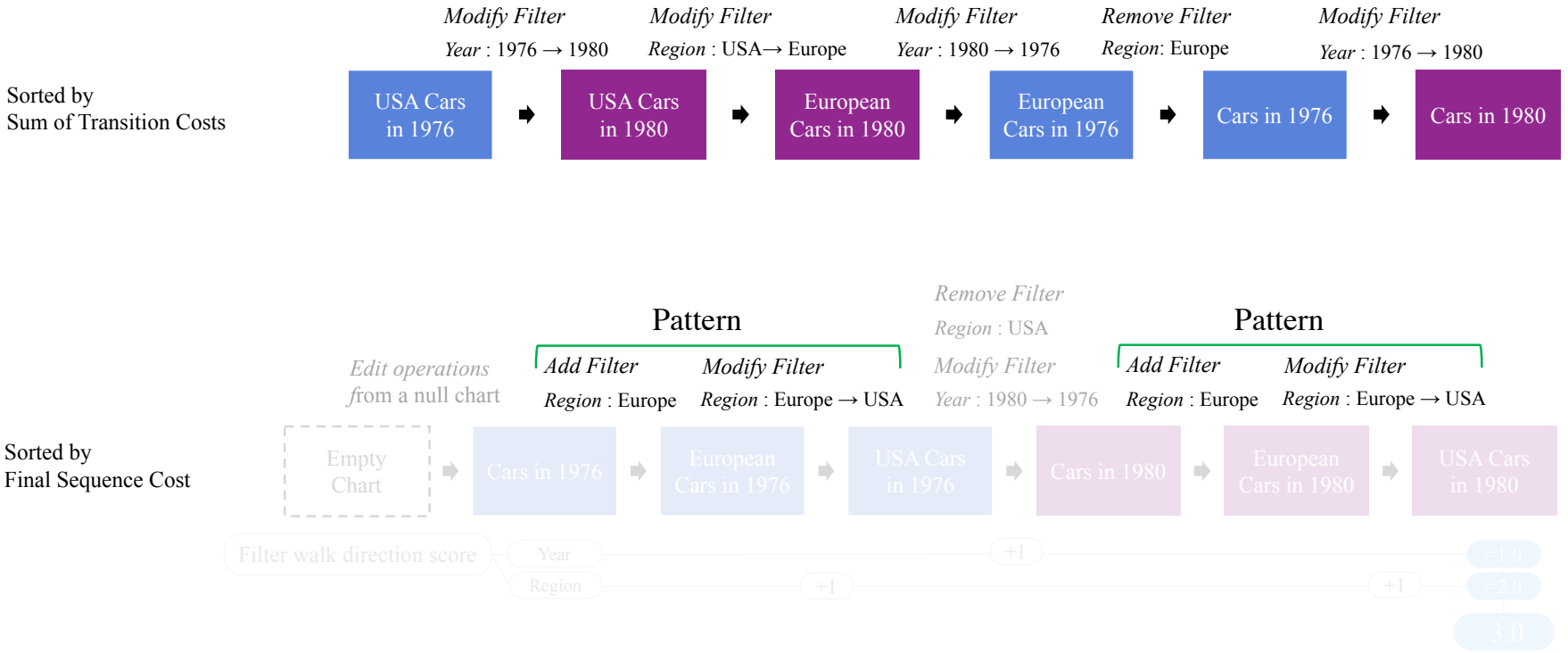
Begin with the empty (null) chart

Account for interpretation of first chart



Prioritize sorted filter criteria

Penalize unsorted orders



Find maximal repeating transition patterns

Determine fraction of transitions they cover

Weight overall score by this term

Sequence Cost Model

Chart Sequence

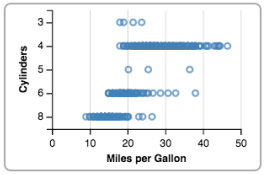
Transition (Edit Distance) Cost

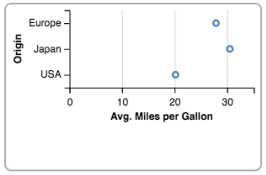
$$Cost(S) = W(S) \cdot \left(\sum_{i=1}^{|S|} T(S_{i-1}, S_i) + F(S) \right)$$

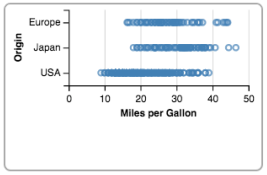
Consistency Weight

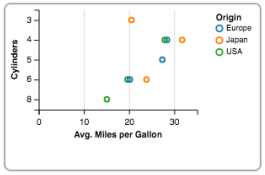
Filter Cost

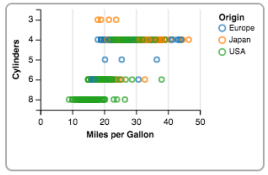
Sequence 1

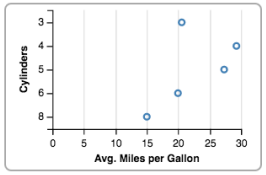






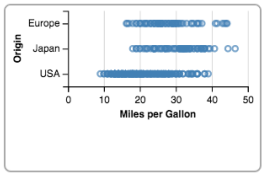


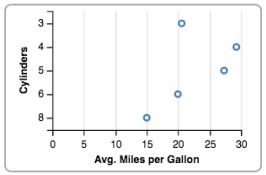


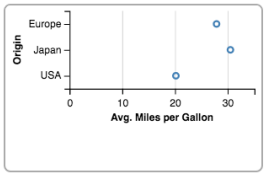


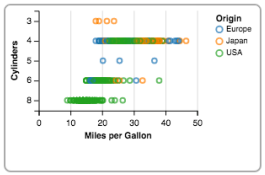
- ○ Very Good
- ○ Good
- ○ Neutral
- ○ Poor
- ○ Very Poor

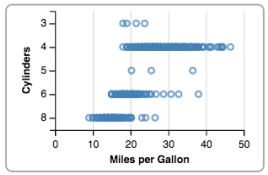
Sequence 2

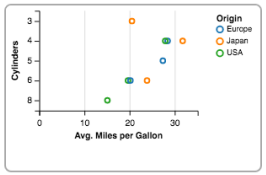






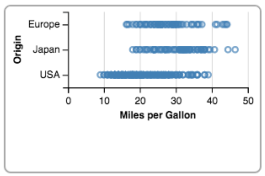


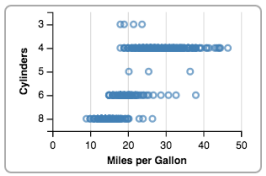


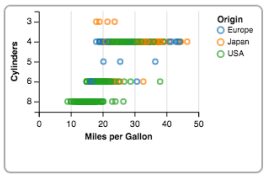


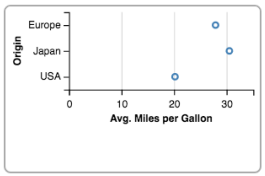
- ○ Very Good
- ○ Good
- ○ Neutral
- ○ Poor
- ○ Very Poor

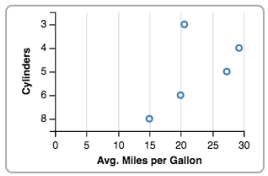
Sequence 3

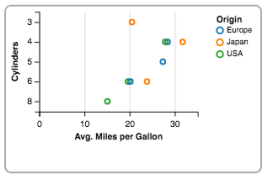






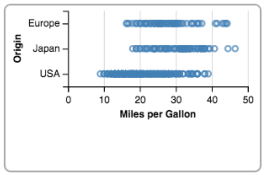


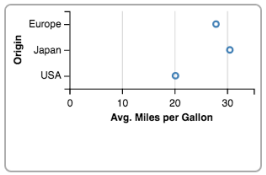


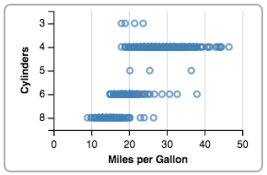


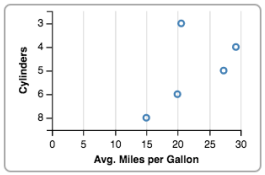
- ○ Very Good
- ○ Good
- ○ Neutral
- ○ Poor
- ○ Very Poor

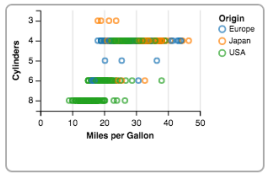
Sequence 4

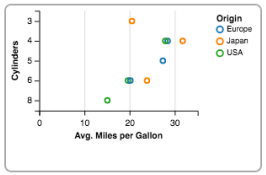






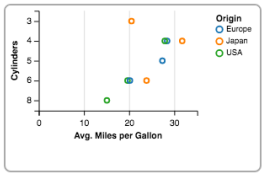


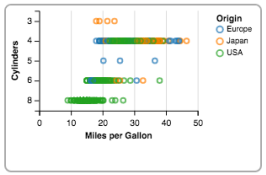


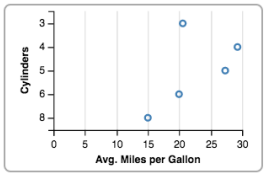


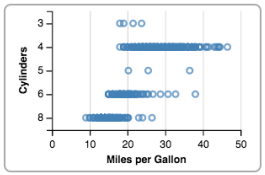
- ○ Very Good
- ○ Good
- ○ Neutral
- ○ Poor
- ○ Very Poor

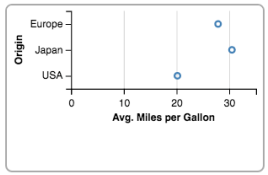
Sequence 5

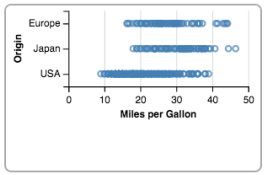












- ○ Very Good
- ○ Good
- ○ Neutral
- ○ Poor
- ○ Very Poor

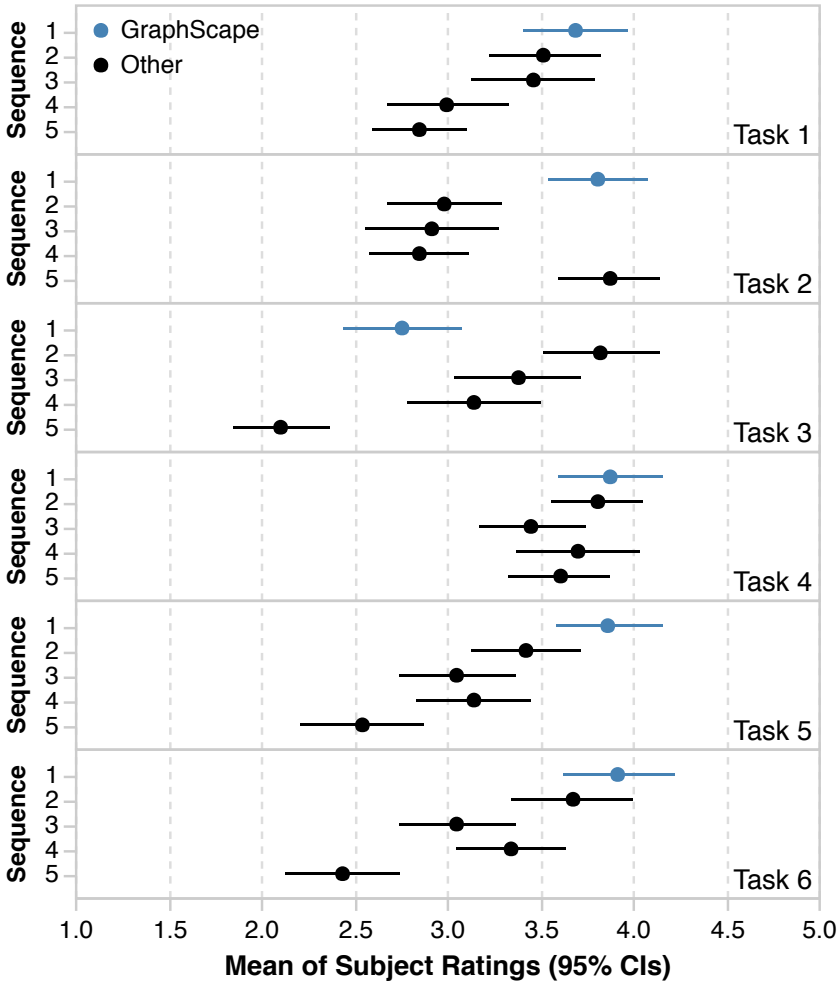
Sequence Ratings

Evaluation with 55 subjects, recruited via Mechanical Turk.

Subjects rated quality and clarity on a 5-point Likert scale.

In all but one case, GraphScape's top pick among highest-rated.

GraphScape correlates strongly with subject rankings ($\rho = 0.80$, $p < 0.001$) when both transition & sequence terms are included.



GraphScape

Previously we've discussed approaches for automatic design of a **single visualization**.

GraphScape supports automated design methods for **collections of visualizations**.

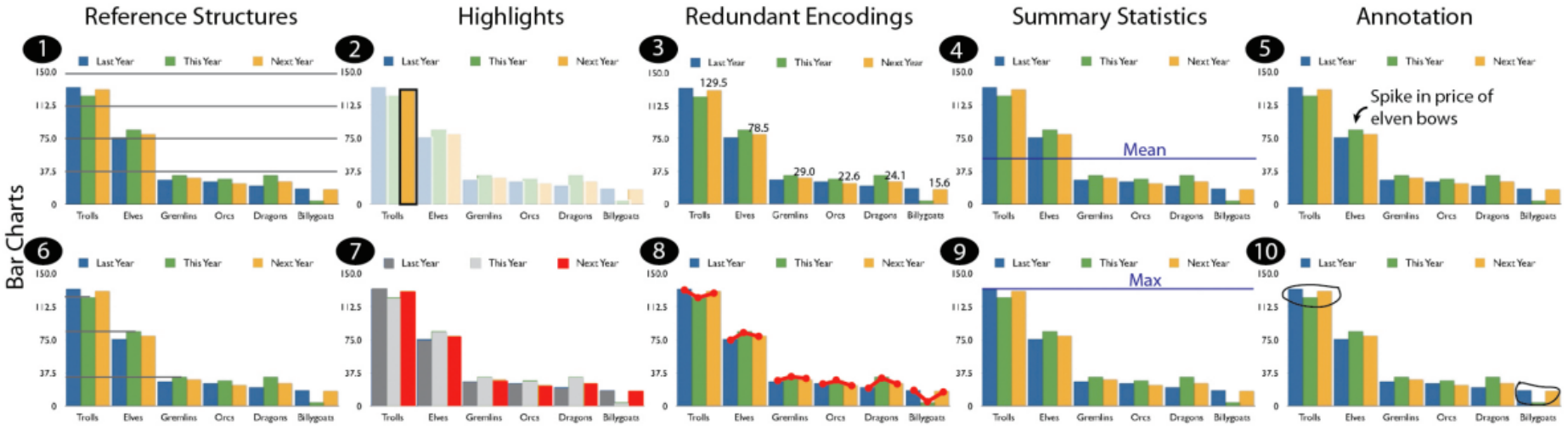
Plenty of future work to do here!

Automatic Augmentation of Charts for Communication

Given existing visualizations, can we adapt them to communicate more effectively?

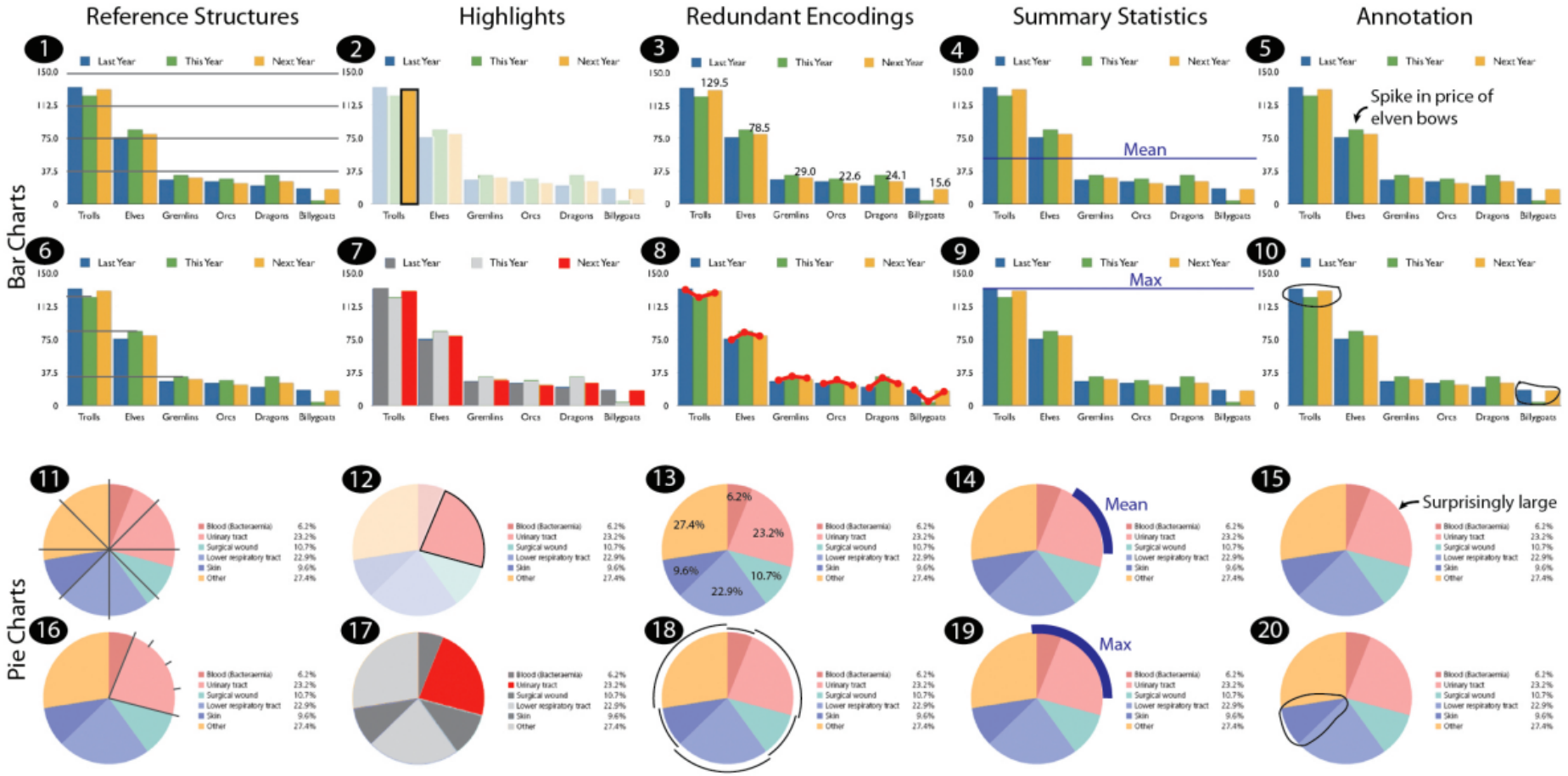
Graphical Overlays [Kong et al. '12]

Add (interactive) reading aids to bitmap charts!



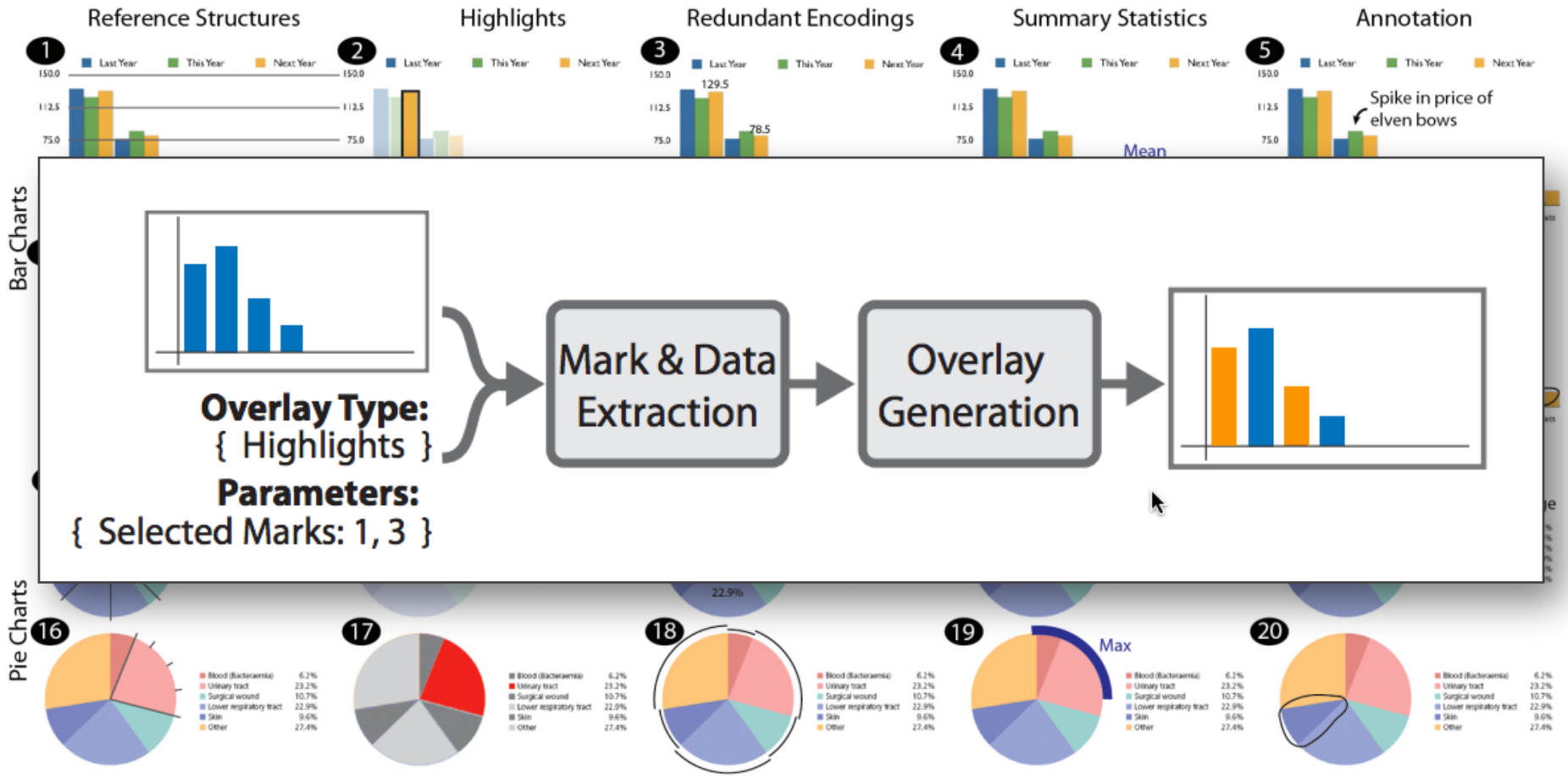
Graphical Overlays [Kong et al. '12]

Add (interactive) reading aids to bitmap charts!



Graphical Overlays [Kong et al. '12]

Add (interactive) reading aids to bitmap charts!



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Apple Passes Microsoft as No. 1 in Tech

By MIGUEL HELFT and ASHLEE VANCE
Published: May 26, 2010

SAN FRANCISCO — Wall Street has called the end of an era and the beginning of the next one: The most important technology product no longer sits on your desk but rather fits in your hand.

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Jim Wilson/The New York Times

Apple fans crowded the iPad demo area at the company's downtown San Francisco store.

The moment came Wednesday when Apple, the maker of iPods, iPhones and iPads, shot past Microsoft, the computer software giant, to become the world's most valuable technology company.

This changing of the guard caps one of the most stunning turnarounds in business history for Apple, which had been given up for dead only a decade earlier, and its co-founder and visionary chief executive, Steven P. Jobs. The rapidly rising value attached to Apple by investors also heralds an important cultural shift: Consumer tastes have overtaken the needs of business as the leading force shaping technology.

Microsoft, with its Windows and Office software franchises, has dominated the relationship most people had with their computers for almost two decades, and that was reflected in its stock market capitalization. But the click-clack of the keyboard has ceded ground to the swipe of a finger across a smartphone's touch screen.

Multimedia

Interactive Feature

Apple and Microsoft's Tug of War

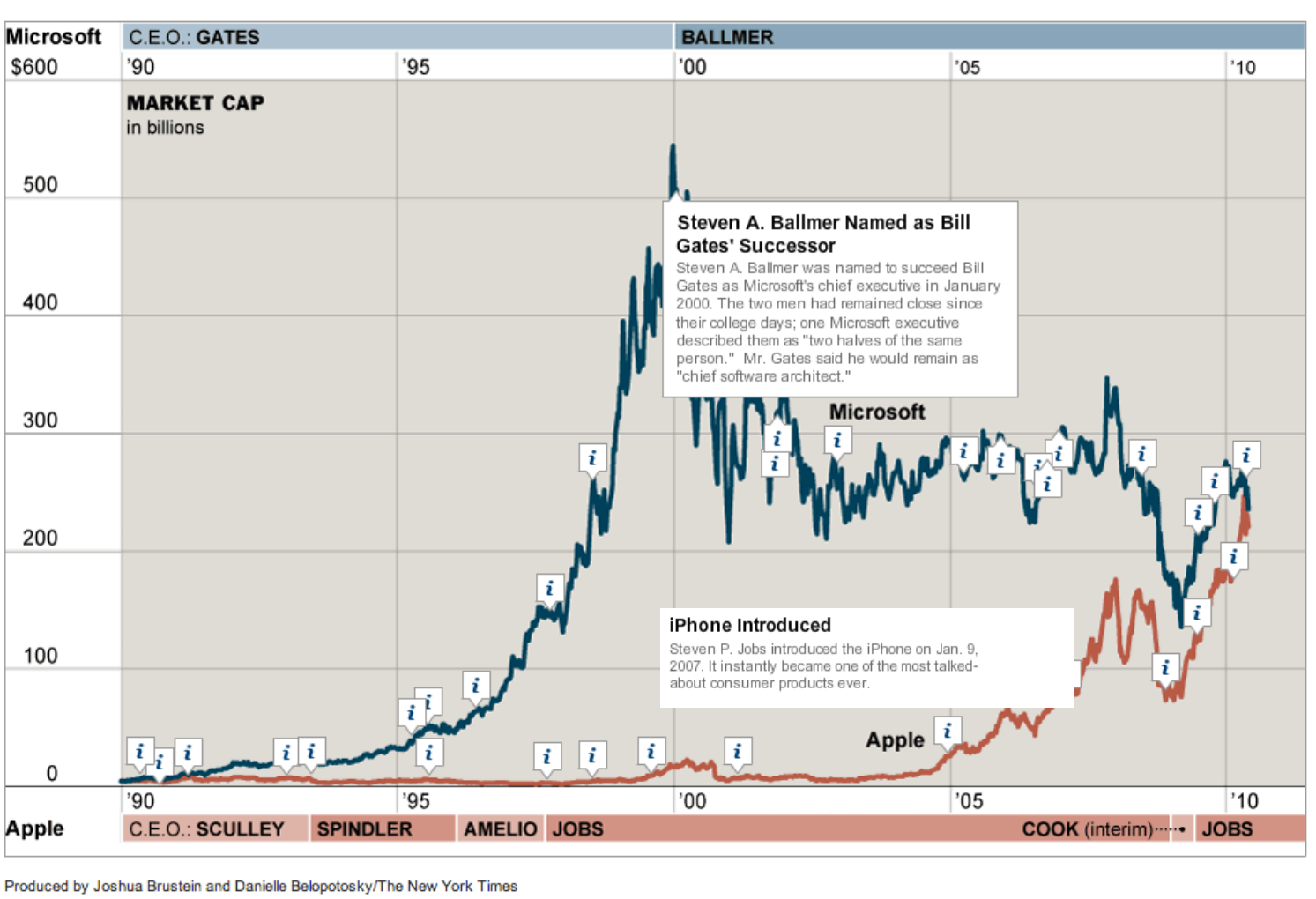
Related

Times Topic: Apple Inc.

Apple and Microsoft's Tug of War

Apple, the maker of iPods, iPhones and iPads, shot past Microsoft on May 26, 2010, supplanting the computer software giant as the world's most valuable technology company. This changing of the guard caps one of the most stunning turnarounds in business history for Apple, which had been given up for dead only a decade earlier. The rapidly rising value attached to Apple by investors also heralds an important cultural shift: Consumer tastes have overtaken the needs of business as the leading force shaping technology. Related Article »

Annotations Tell a Story



Produced by Joshua Brustein and Danielle Belopotosky/The New York Times

Can we produce an automated solution?

Contextifier System [Hullman et al.]

Input: news article about a company

TECHNOLOGY

Yahoo Decides to Friend Facebook

Email Print Save 6 Comments

By AMIR EFRATI

Updated Feb. 15, 2011 12:01 a.m. ET

Yahoo Inc. YHOO +1.34% watched as social-networking website Facebook Inc. stole the attention of users and grabbed a major share of the online-advertising market.

Now the Internet pioneer is following an old mantra: If you can't beat 'em, join 'em.

Enlarge Image

CEO Carol Bartz is trying to grab more traffic for Yahoo through the company's recent ties with Facebook. *Bloomberg News*

After struggling for years to develop services that compete with the social network, Yahoo in recent months has installed tools such as Facebook's "Like" and "Share" buttons on its news and sports websites in order to help Yahoo users share articles with their contacts on Facebook, among other things.

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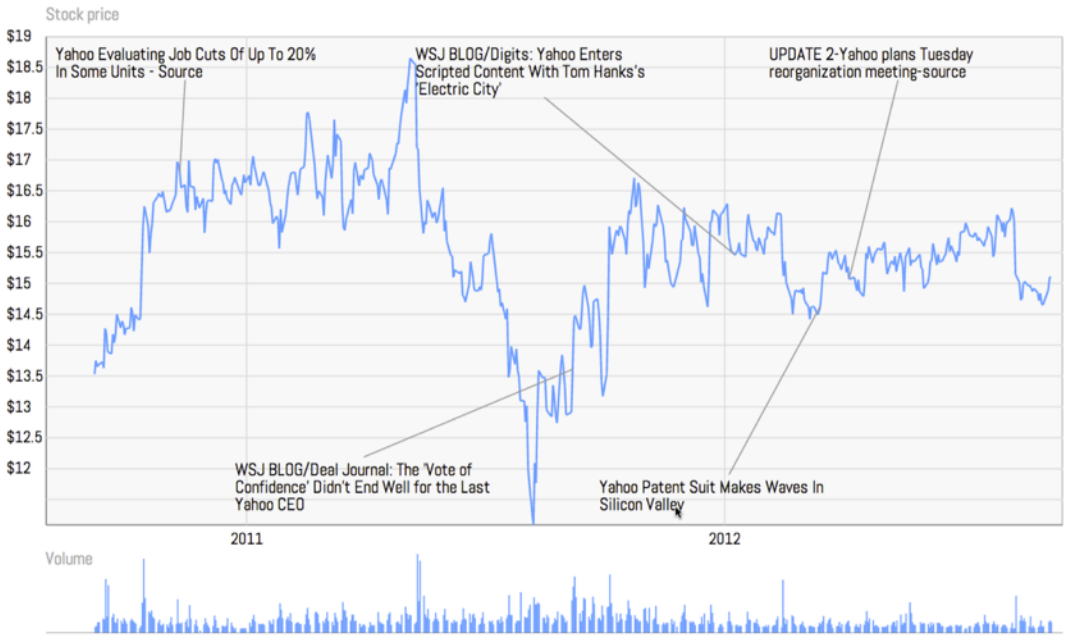
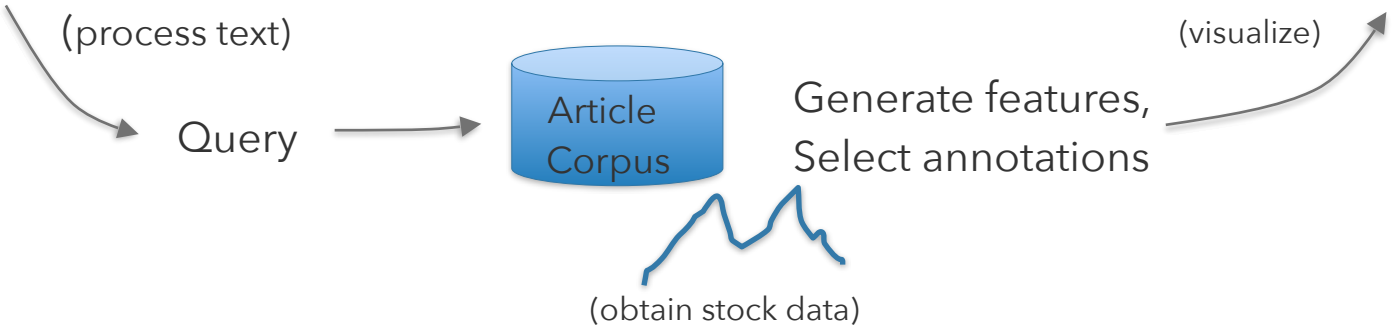
Closing price



Volume sold



Relevancy Feature

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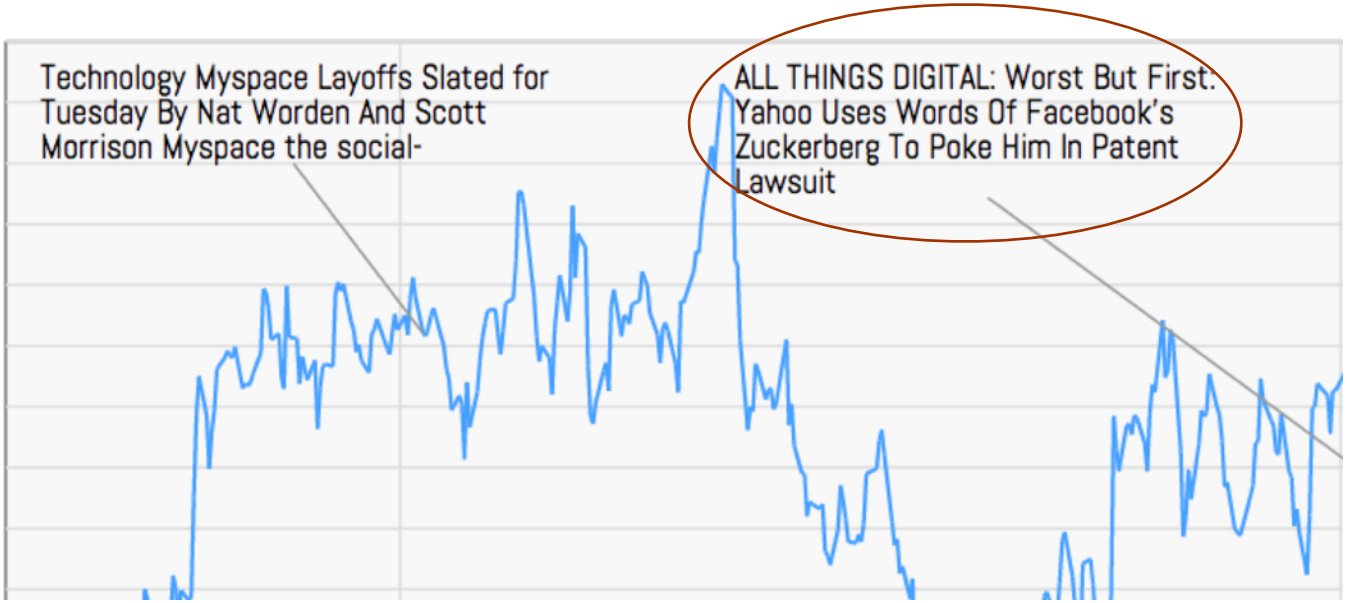
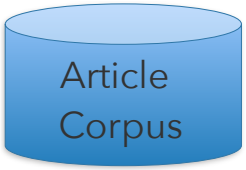


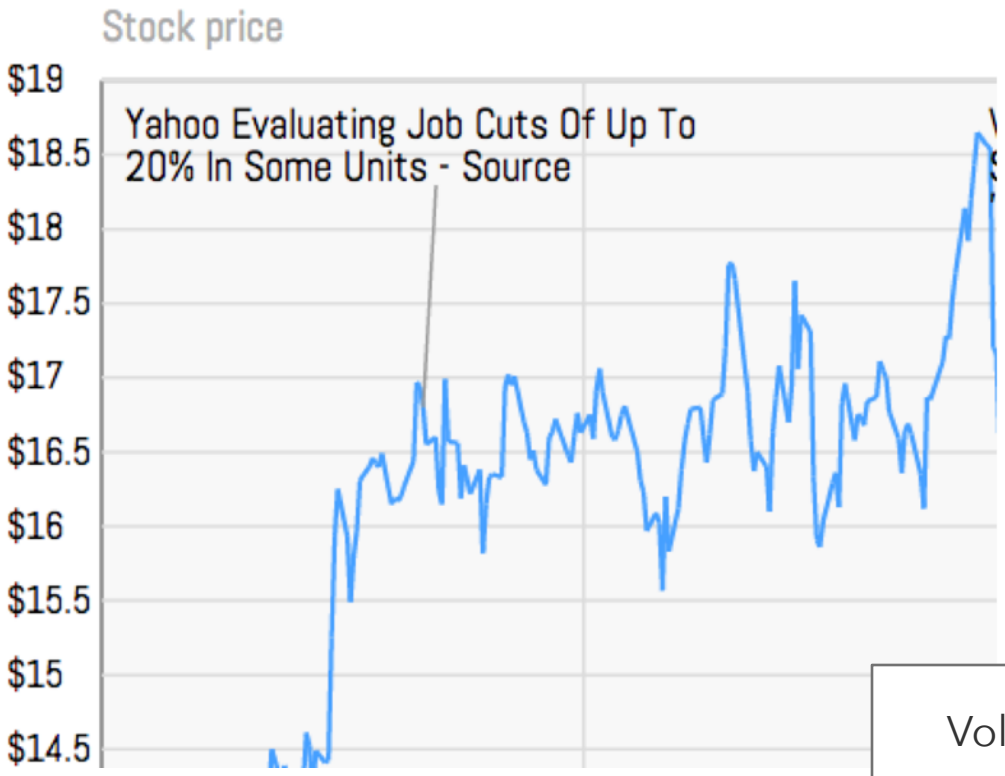
Do other articles that mention the company have relevant content?

Use Kullback-Leibler divergence to measure difference.

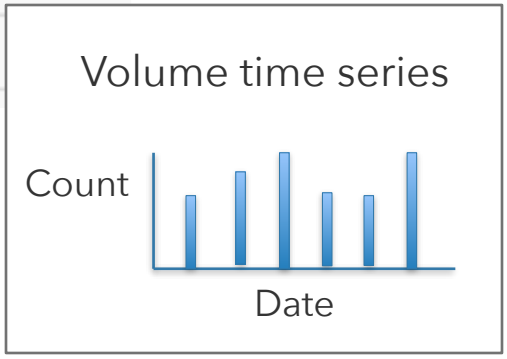
$$D_{KL}(P \| Q) = \sum_i P(i) \log \frac{P(i)}{Q(i)}$$



Article Volume



Prioritize dates with unusually high numbers of company articles.



Visual Saliency

TECHNOLOGY

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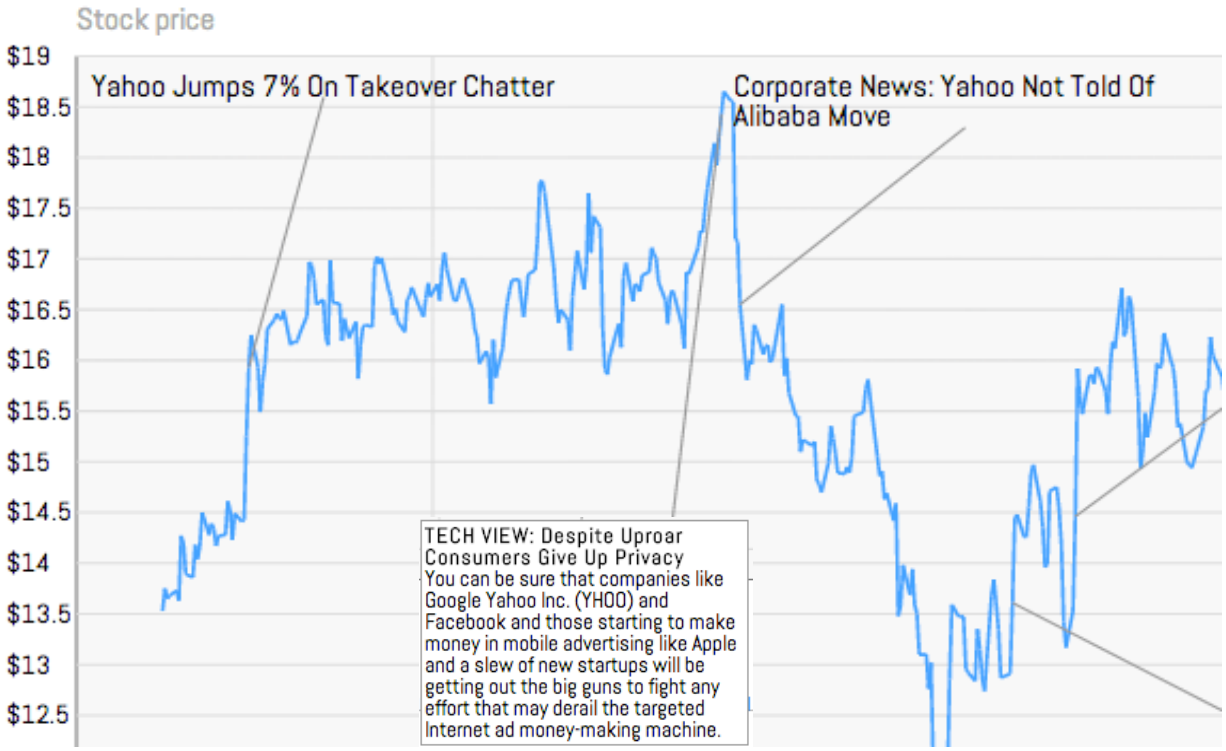
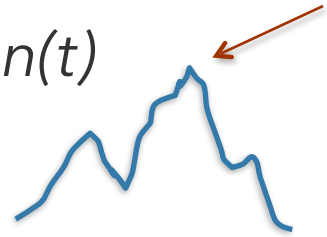


Visual saliency proxy via simple analyses on stock series.

max(t), min(t)

$t_i - t_{i-1}$



Collaborative Visualization

sense.us

A Web Application for Collaborative Visualization of Demographic Data

Heer, Viégas & Wattenberg, 2007

sense.us > social data visualization - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://sense.us/

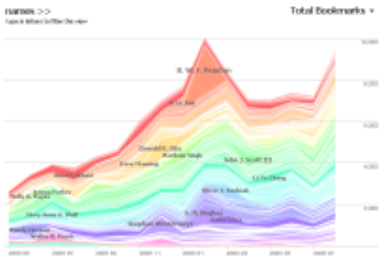
Google

sense.us

Log in to add comments! ibm e-mail pass login help

Dogear Tags

Dogear Tag Usage, May 2005 to August 2006
source: IBM Dogear
10 comments



Dogear People

Dogear Bookmarking by Person, May 2005 to August 2006
source: IBM Dogear
1 comment

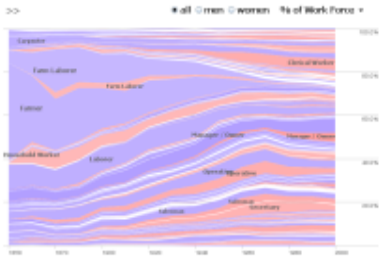
sense.us - social data visualization

sense.us is a prototype system for collaborative visualization.
- See the data. See what people have to say about it.
- Dive into the data and share your explorations.

The site requires **Java 1.5+** and either **Firefox** or **Internet Explorer**.
Use your **IBM W3/BluePages e-mail and password** to login.
Use at least **1024x768** resolution for the best experience.

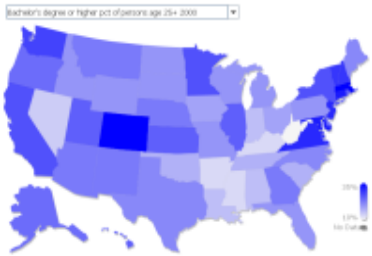
Check out the **user's guide** and **privacy policy** before getting started.

Having problems using Firefox with Java 1.4? Some users using Firefox and Java 1.4 have found that comments aren't loading properly. If you run into this problem, consider upgrading to Java 1.5 (**Windows**, **Linux**) or using Internet Explorer (on Windows systems). Sorry for any inconvenience!



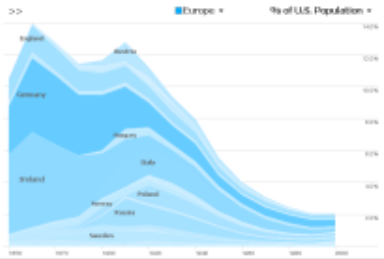
Job Voyager

Reported Occupations of U.S. Labor Force, 1850-2000
source: http://ipums.org
139 comments



U.S. Census State Map

State Map of 2000-2005 Census Data
source: U.S. Census Bureau
16 comments



Birthplace Voyager

Reported Birthplace of U.S. Residents, 1850-2000
source: http://ipums.org
10 comments

Population Pyramid

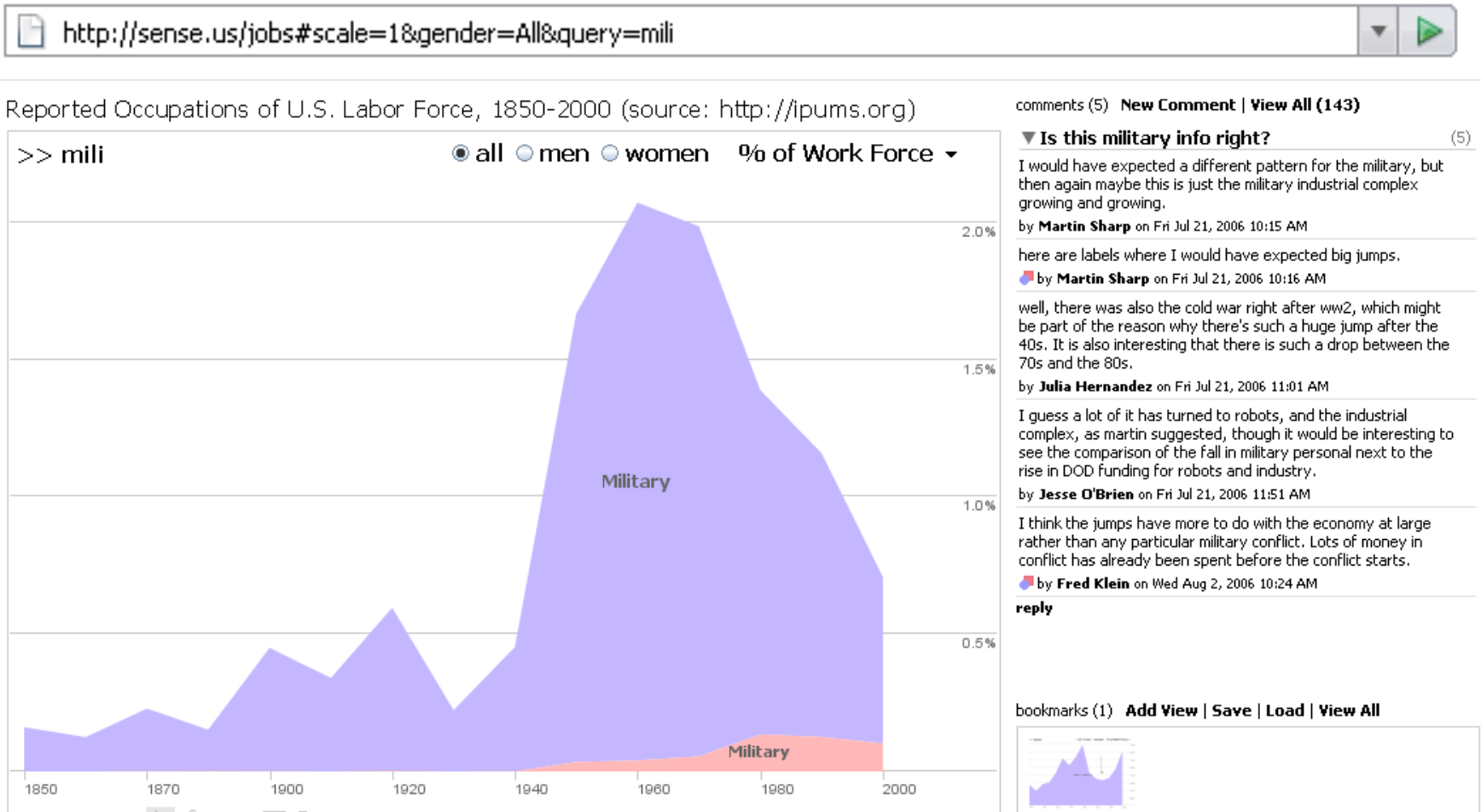
U.S. Population Demographics, 1850-2000
source: http://ipums.org
7 comments

[CHI 07]

Done

Supporting Collaboration

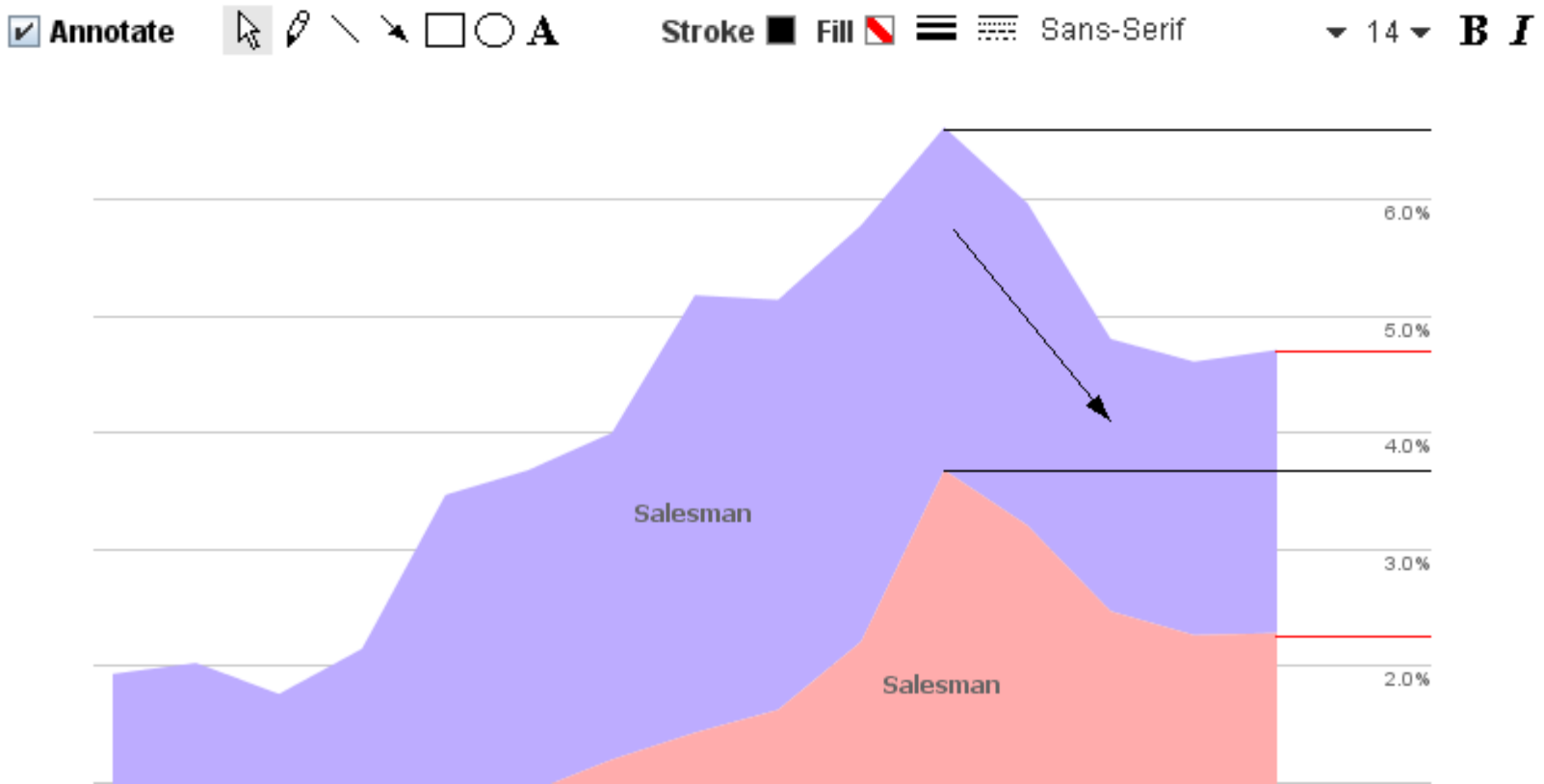
Sharing within visualizations and across the web



Supporting Collaboration

Sharing within visualizations and across the web

Pointing at interesting trends, outliers

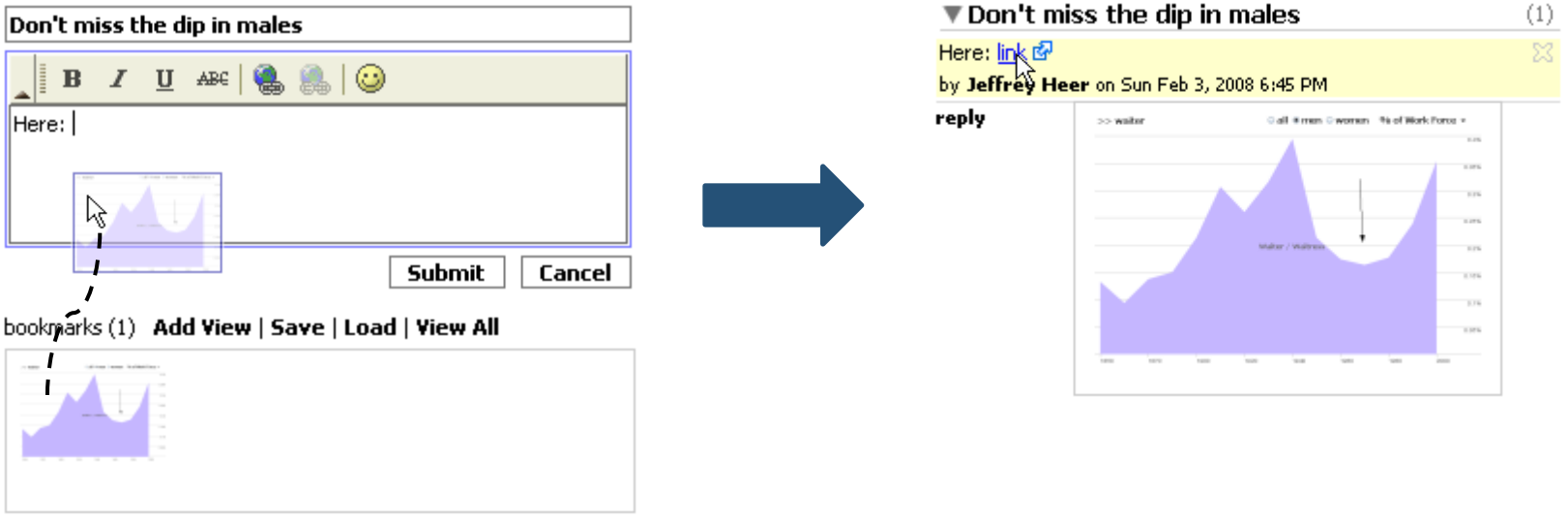


Supporting Collaboration

Sharing within visualizations and across the web

Pointing at interesting trends, outliers

Collecting and linking related views



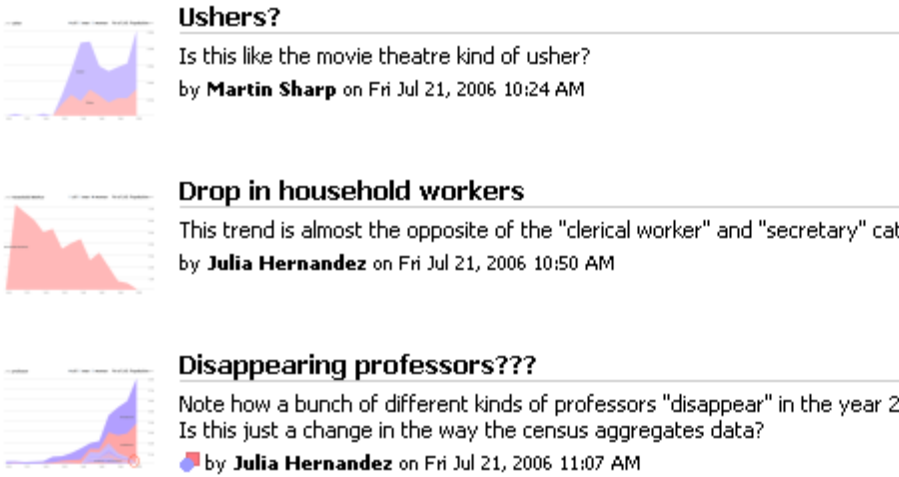
Supporting Collaboration

Sharing within visualizations and across the web

Pointing at interesting trends, outliers

Collecting and linking related views

Awareness of social activity



Supporting Collaboration

Sharing within visualizations and across the web

Pointing at interesting trends, outliers

Collecting and linking related views

Awareness of social activity

Embedding in external media (blogs, wikis, …)

Supporting Collaboration

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Pointing at interesting trends, outliers

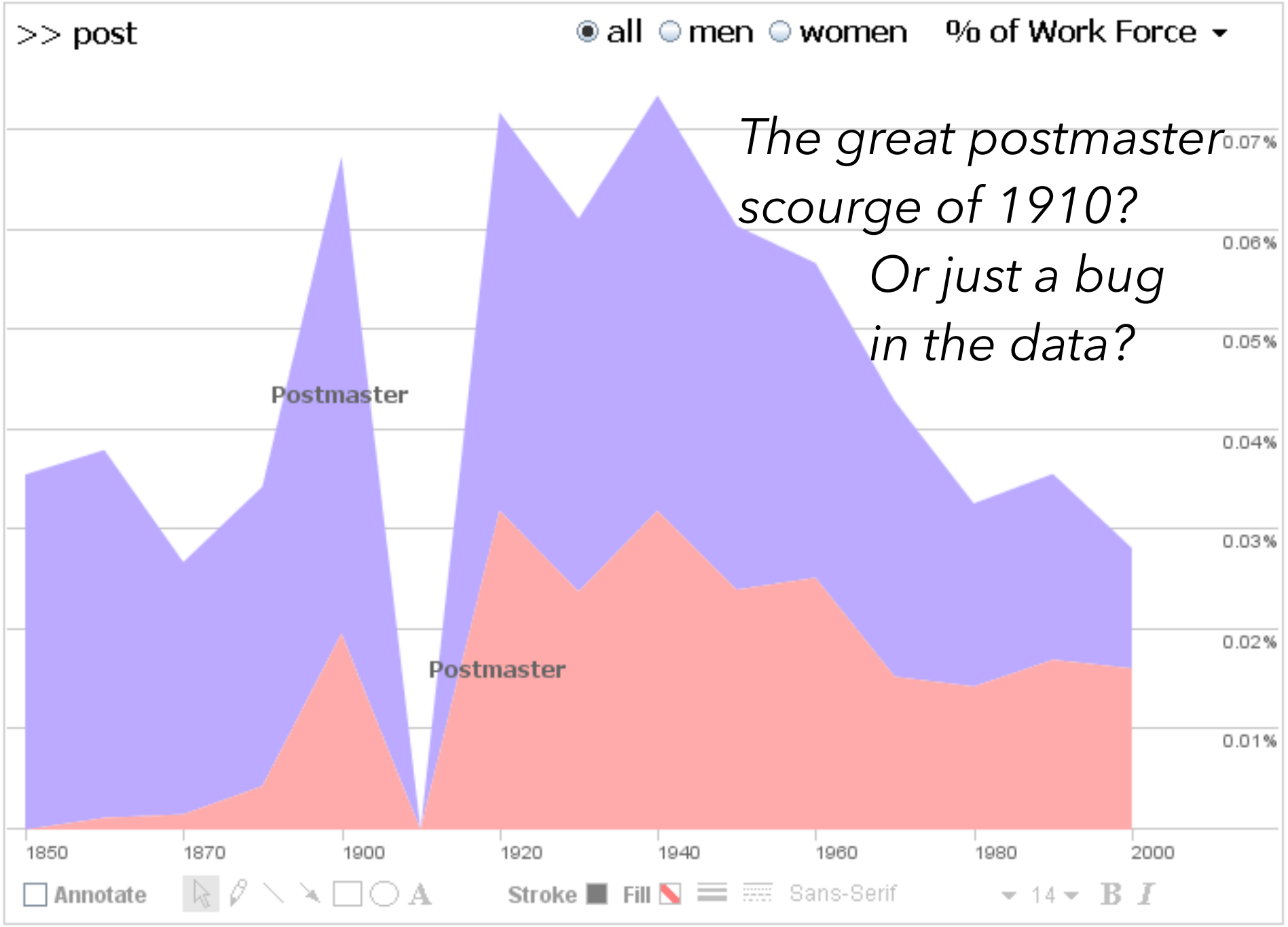
Collecting and linking related views

Awareness of social activity

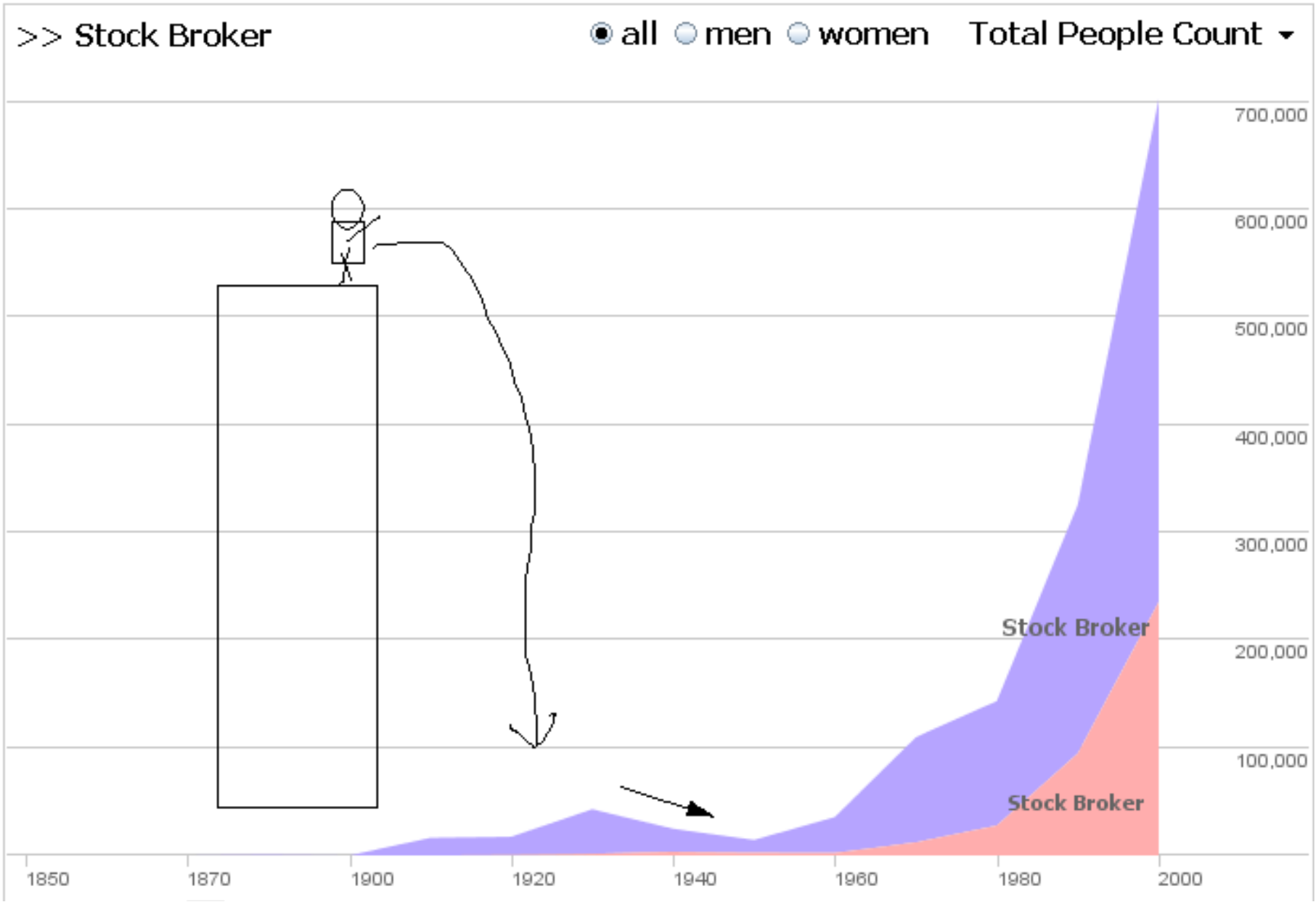
Embedding in external media (blogs, wikis, …)

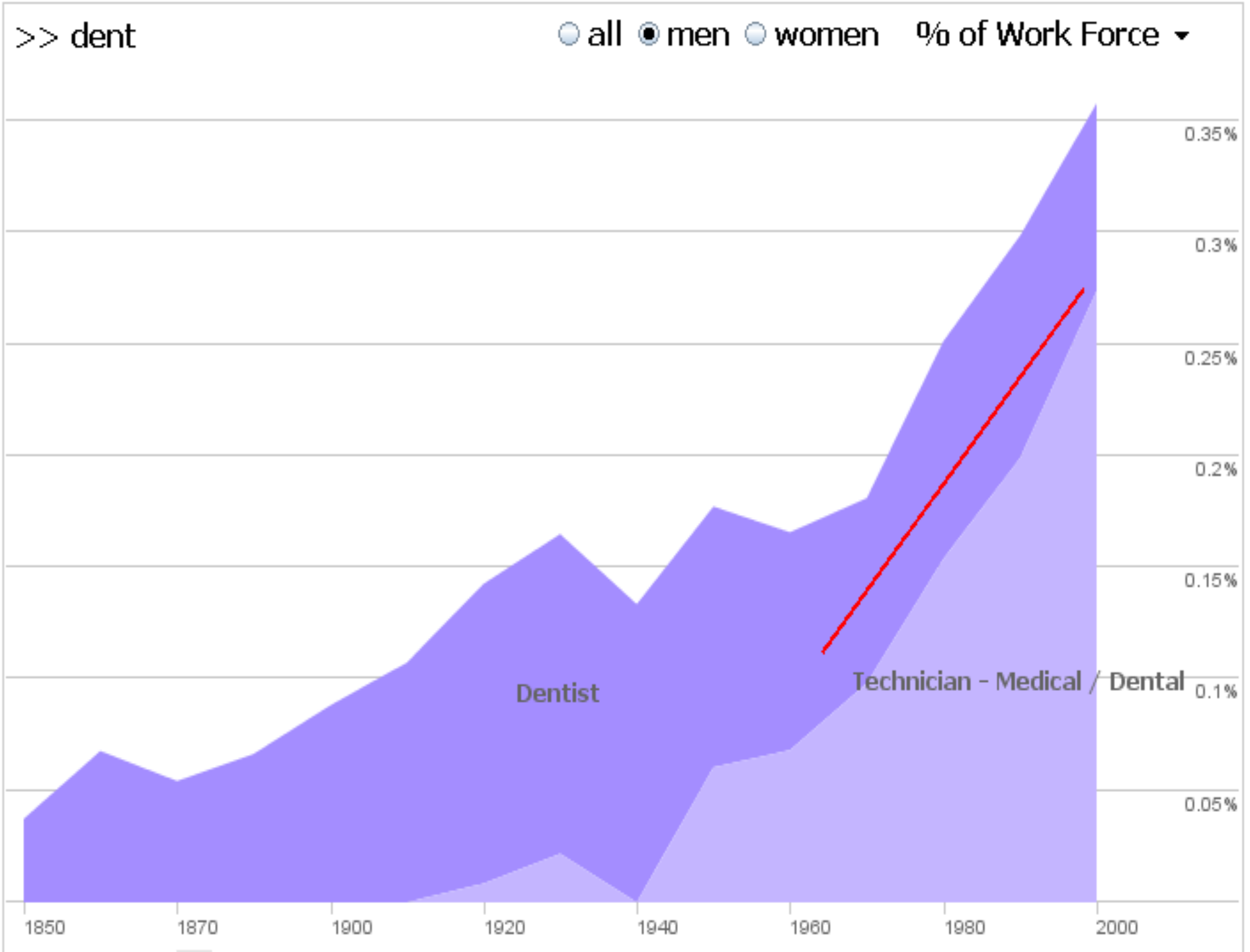
Don’t disrupt individual exploration

Social Data Analysis


>> post
all
men
women
% of Work Force
The great postmaster scourge of 1910?
Or just a bug in the data?
Postmaster
Postmaster
0.07%
0.06%
0.05%
0.04%
0.03%
0.02%
0.01%
1850
1870
1900
1920
1940
1960
1980
2000
Annotate
Stroke
Fill
Sans-Serif
14
B
I

Great depression "killed" a lot of brokers

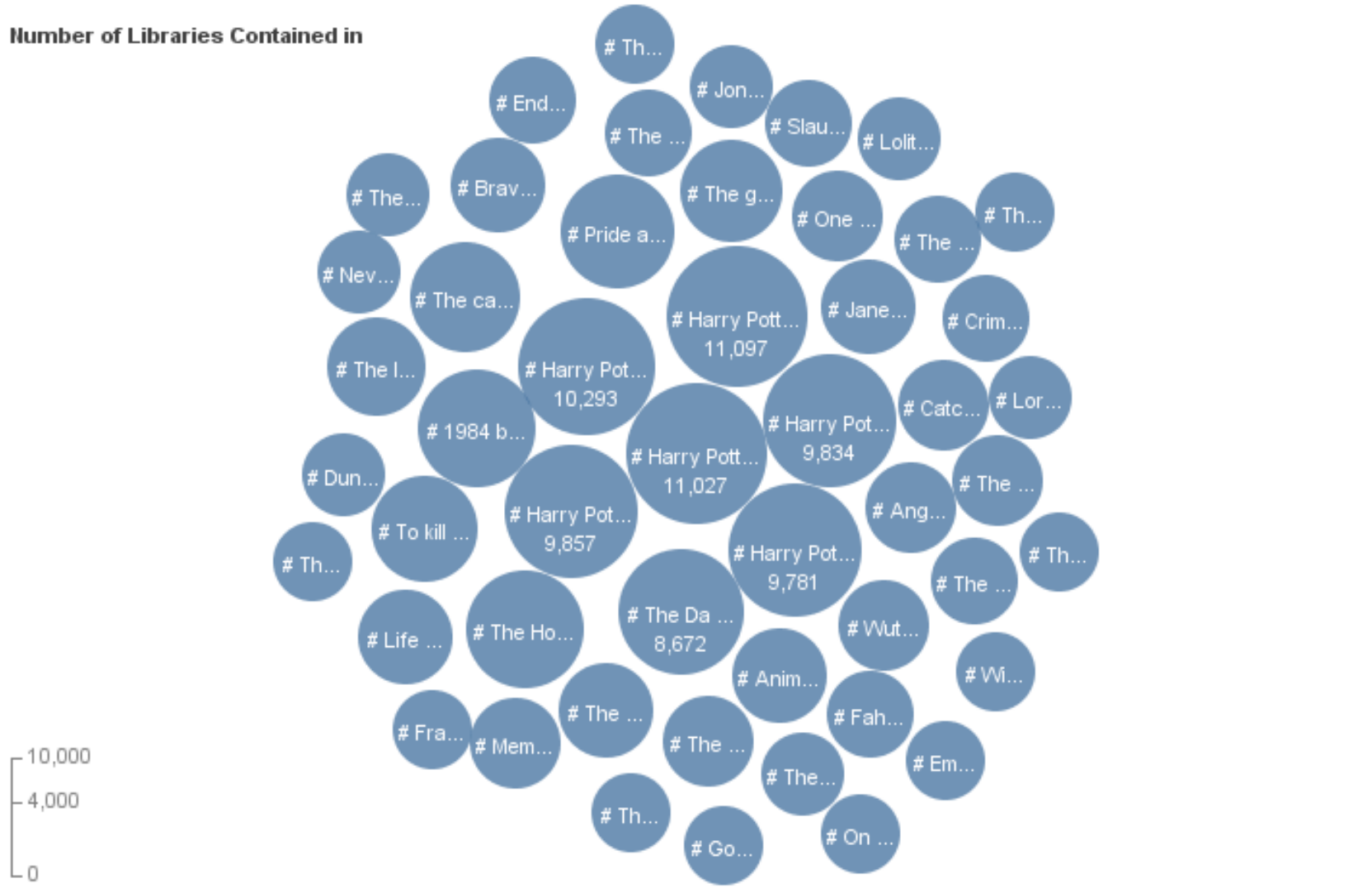


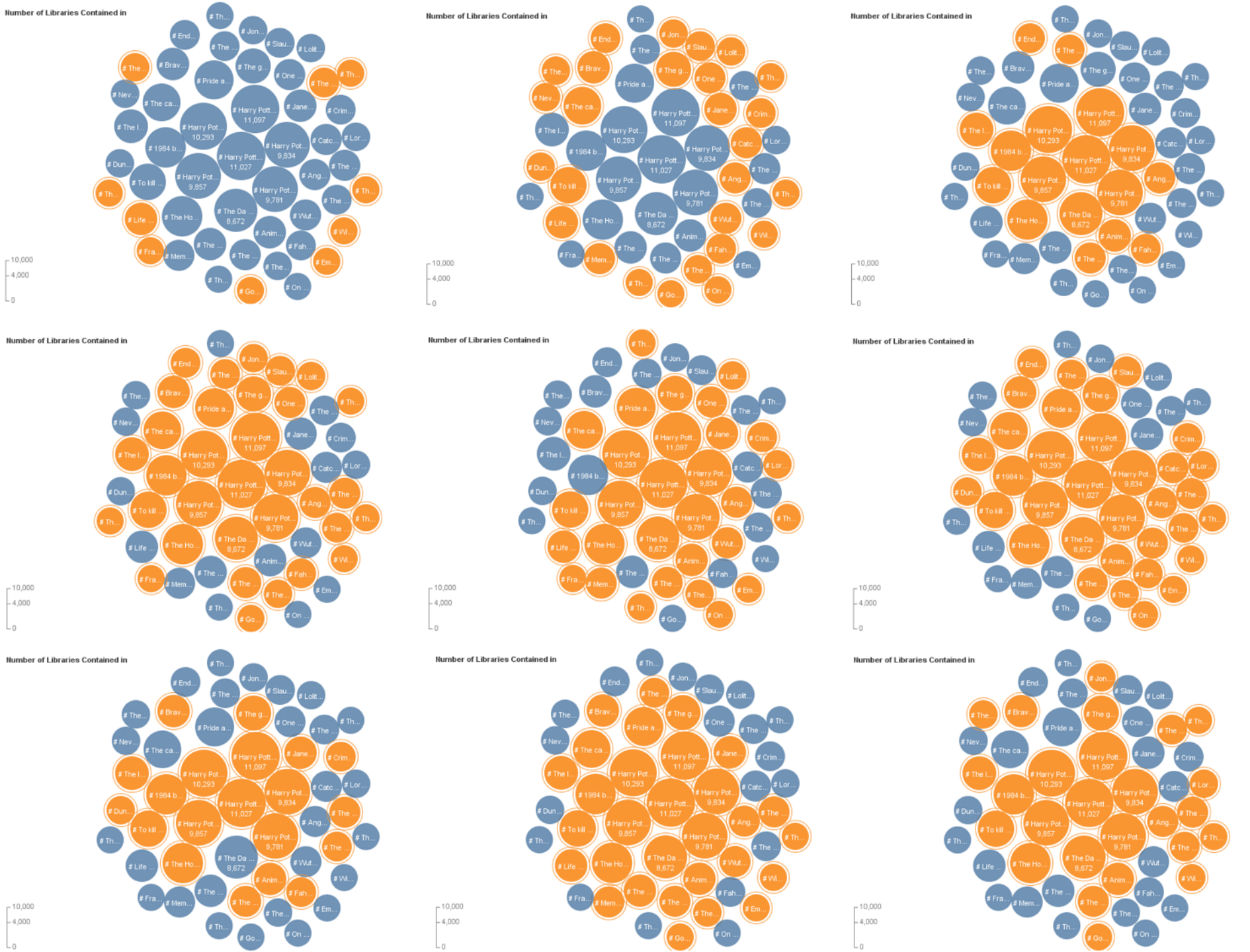

>> dent
all
men
women
% of Work Force
0.35%
0.3%
0.25%
0.2%
0.15%
0.1%
0.05%
Dentist
Technician - Medical / Dental
1850
1870
1900
1920
1940
1960
1980
2000

Public Visualization as Survey Instrument

Visualizations : Harry Potter is Freaking Popular

Creator: Alison
Tags:




Number of Libraries Contained in
10,000
4,000
0

Showing the **1000** most recent of **2291** total comments. Older Comments

Colors show if people think that: income inequality has contributed to the country's problems. Disagree Agree

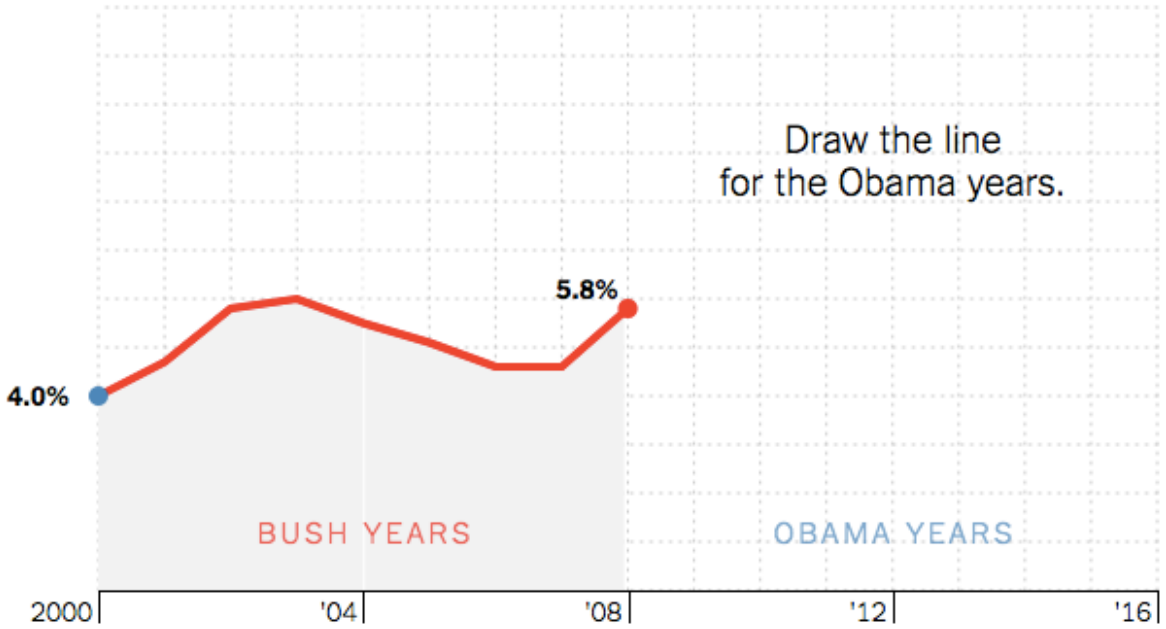
Do you agree or disagree with the main goals of the Occupy Wall Street movement?

You Draw It: What Got Better or Worse During Obama's Presidency

By LARRY BUCHANAN, HAEYOUN PARK and ADAM PEARCE JAN. 15, 2017

Draw your guesses on the charts below to see if you're as smart as you think you are.

Under President Obama, the **unemployment rate** ...



Show me how I did.